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For subscription services or information phone toll-free 1-800-435-0715 (except Illinois)
Timex Sinclair User is published monthly by ECC Publications Inc. in conjunction with C .W.
Communications/lnc.
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Timex Sinclair User
ISSN 0737-0881

## Typesetting

International Typesetting

## Printing

Clark Franklin Kingston Press
Advertising Sales
JE Publishers Representative Company
6855 Santa Monica Blvd., Suite 200. Los Angeles, CA 90038 Los Angeles (213) 467-2266
New York (212) 724-7767
Denver (303) 595-4331
Dallas (214) 660-2253
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# Looking Back And Looking Ahead 

IT HARDLY SEEMS POSSIBLE to us here, but this is our seventh issue. The time has flown by and the excitement has just kept increasing. As you and your friends and family do at this time of year, we at Timex Sinclair User also have been reflecting on the past year. When we began to get the first issue ready last January, we knew there was a need for Timex Sinclair User but what we didn't anticipate was your terrific response and support.

We admit we've made a few mistakes (we wouldn't be a member in good standing of the Timex family if we didn't make mistakes) and some we can almost laugh about now.

Over the past six issues we have enjoyed your letters more than anything else (well, to be honest, there was one that - but we'll forget that one!). Your letters are our lifeline, our connection to the real world, our report card, our handshake with you. Please, as Dean Martin used to say, keep them cards and letters comin'.

As well as for nostalgia and pleasure over past accomplishments, this time of year is also a time for renewing spirits, renewing commitment and re-
establishing goals. At Timex Sinclair User we are more enthusiastic than ever over the ideas, articles, offers and special events we have planned for the new year - one example of which is well illustrated by the special program Bob Fraser wrote for you (see page $11)$.
Taking a moment to talk about this issue, I'll just mention Timex Sinclair User's Christmas Shoppers' Guide. It is a separate magazine inside a magazine that can be used to help you with your Christmas shopping. Just about anything you'll need or want for happy and enjoyable computing is listed.
It's interesting that using a computer, which is supposed to be a solitary activity, brings so many people together. Let the so-called experts have their say, but it is abundantly clear to us that computing, rather than isolating us from each other, rather than separating people from other people, does just the opposite. You people are the living proof!
From all of us at Timex Sinclair User a very merry Christmas and a great new year!
Happy programming!
0,0

## Stranded On Mars

# Martian Journey 

## MARS

Aardvark, 16 K
This is not a fast action game but an adventure game. It is ideal for someone with a great deal of patience and imagination, and an adventurous spirit. If you have a couple of hours or more to spare, then load it up, sit back and venture into another world.
You are stranded on Mars with a spaceship in need of repairs. Solving one problem seems to lead to various others. You must venture out into the Martian city, collect usable objects, dispose of others, but most of all be very observant. To add to your task, hostile aliens follow you around relocating objects for which you may be searching.
In this text adventure game you use word commands to inform the computer of your actions. co through various rooms, Look carefully at everything, TAKE anything that may be useful, DROP the objects of little value and discover new commands which are helpful in your pursuit.

Chances are great that you won't be able to solve it
the first time, as a normal game will run from 30 to 50 hours. Therefore (as noted in the instructions) you must break into the program to save it in progress. It would have been easier if a saving routine had been included in the program. The instructions included are satisfactory as they explain how to play an adventure game in general. Since the program runs in fast mode you may only wish to play it for a couple of hours at a time and then give your eyes a rest.
Putting aside these few faults, I recommend it to those who would like to try their hands at a little adventuring. The hours of enjoyment are well worth the price.
$\star$ * $1 / 2$
For more information, circle 5 on the reader service card.

## Not So Super

SUPER INVASION

## Softsync, 1 K

This space invaders game has been written in fast mode and as a result it produces a constantly blinking screen which is very irritating to the eyes. I was able to play it for only a couple of minutes at a time.

You shoot up at one type of alien while it drops bombs on you. It offers three levels of play: however, once a level is chosen you must reload the game to choose another. Better planning would have produced an acceptable game.
For more informotion, circle 6 on the reader service card.

## Othello

## REVERSI

Melbourne House, 1K
This is an interesting version of the popular board game, Othello. You play against the computer on an $8 \times 8$ grid, trying to dominate the board with your color.

The program gives you the option of either making a move which is checked for legality, or passing which can be done to force the computer to move next. Although it is written in machine language you may press the break key to end the game. It also keeps the score; the number of squares you control is displayed alongside the number controlled by the computer.
Though the representation of the pieces is adequate, a better selection of graphics would definitely enhance the game. The instructions included with the program made it easy to learn, as I had never played Othello before. It took me four games to figure out why the computer won each time. Since then, I have been able to consistently beat it.

## - Greg Brooks

For more informotion, circle 7 on the reader service cord.

zXAD is an assembler program that includes basic debugginglediting capabilities. It allows the use of eight pseudo-ops (ORG, REL, END, DEFB, DEFW, DEFC, DEFS and EQU) and sixcharacter symbols/labels, something few available assemblers permit.
For those who are unfamiliar with the term, an assembler is a program which aids the user in writing machine code programs. It does this by taking a listing written in assembly mnemonics, called the source code, and translating it into machine code. For example, an assembler takes the source statement "LD A,B" and translates it into the number 78hex, which the Z-80 microprocessor can understand. Using labels, an assembler can automatically calculate addresses, freeing the user from that tedious and error prone task. Programs can be written using
statements like "CALL NEXT" or "LS HL, (COUNT)" without worrying about the exact addresses of NEXT and COUNT. Labels make it simple to shift a program about in memory, making it a snap to insert or delete instructions to correct a bug.

A pseudo-op is an instruction included in the source code that tells the assembler what to do, but does not get translated into machine code. The ORG pseudo-op instructs the assembler where in memory to store the machine code as it is being assembled. rec tells where in memory the machine code will be executed. (This is not necessarily the same place that the machine code is stored. The code may get moved.) END signals the end of the source code. DEFB and DEFW indicate that the numbers immediately following them are to be directly included in the machine code. DEFB assumes the numbers are single bytes and DEFW
assumes the numbers are two-byte words. These two pseudo-ops are useful in setting up data tables.DEFC causes the character codes of the immediately follow-
ing string to be stored in the machine code. For example, DEFC "ABC" causes the bytes 26, 27 and 28 (all in hexadecimal) to be included. defs leaves open a cer-

Figure 1. Sample of assemble and print option.


## Subtarare

tain number of bytes which can then be used for temporary storage. EQU assigns a numerical value to a symbol or label.

Symbols are strings of up to six characters used in the source code to represent constant numbers. For example, the symbol Lines can be used in place of the number 16hex in the instruction LD A,LINES Symbols make the source code easier to understand while also providing a way to change the value of a constant throughout the program (by changing one EQU statement).

The number of symbols/labels that can be used in the source code is only limited by the size of free memory.
The first line of ZXAD is a REM statement that contains the machine code that actually handles the conversion from source code to machine code and the debugging/editing. The 102 remaining lines of BASIC create the display and gather input from the user. Including the display file, ZXAD occupies just over 8 K bytes of memory.

Figure 2. Function menu.

The user's source code statements are stored in REM statements above ZXAD's 103 lines. One source statement plus a comment are allowed per REM. ZXAD has a line renumber function which makes it simple to insert new lines of source code.
ZXAD offers three assembly options. One simply assembles the code and displays any error messages; the others, assemble the code and either display or print out addresses, machine code, source code, and error messages (see Figure 1).
zXAD provides simple debugging features. Memory can be examined and edited in hex. Also a breakpoint address can be selected. When this address is reached during a run of the machine code, a branch is made to a routine that displays the values of all the registers. The machine code program does not stop after the breakpoint - it continues on leaving a snapshot of the Z-80's state at that address. ZXAD does not provide the single-step or disassembly capabilities found in other debugging programs such as Sinware's HOT $Z$.


ZXAD is very easy to use. Source code is standard Z-80 mnemonics, but uses only hexadecimal numbers. Functions are selected from a menu (see Figure 2). The instruction booklet is very well written, though it assumes a familiarity with machine language programming. It includes tips about the most common programming mistakes and contains a list of all the mnemonics in the form that exaD recognizes.
My only complaint about zxad concerns the five error messages: they are not specific enough. "BAD OP-

CODE" can mean everything from a missing space to an incorrect number. This vagueness can be frustrating until you become familiar with zXAD's syntax.
Overall, the zXad assembler is very useful, fullfeatured, and easy to use. Its instructions are clear and complete. It has some debugginglediting capabilities, but it is not a complete debugger/disassembler.

## - Allan C. de Frates

For more informotion, circle 8 on reoder service cord.

# Machine Code Tape Offers Seven Utilities 

## MACHINE CODE TEST TOOL

Oxford Computer Publishing, 16 K

There are several programs of this nature on the market. They are sometimes referred to as debuggers since their main purpose is to perfect machine language programs. This one is fairly short and locates itself automatically above RAMTOP, leaving the program area entirely free. It's about 1,700 memory-bytes long and offers seven utilities: hex to decimal conversion, and vice versa; a loader that allows you to enter 1 byte hex numbers sequentially from a given address; a breakpoint facility; a routine that displays register contents; a memory display function that screens the contents of 120 addresses as characters and hex numbers; and, finally, a function to execute your routines from within the program.
The main qualities of Machine Code Test Tool:
small size, ease of use, and clear documentation. It's debugged and difficult to trip up, which is more than most programs of this type can claim. Its faults: a lack of flexibility in implementing the available functions, and the omission of many features found on larger programs such as a disassembler, block manipulation, search \& replace, and so on. This makes the program viable, strictly for the beginner who is interested in short machine code subroutines in a basic framework. The documentation included with the cassette supports this argument. In a nutshell, the Machine Code Test Tool is well designed, compact and "user friendly," but its limited features restrict its use to the beginner.

- Andrė Roussil

For more informotion, circle 9 on reoder service cord.

## Keyboard Winner

I was sorry to see that in " 6 Keyboards compared"' (Issue 3) you did not include the Suntronics KD-81 keyboard. This keyboard is far superior to any I have seen with 41 keys, including two shifts and a full space bar, touch-typing is quite possible. It's an excellent buy at only $\$ 69.95$.

I must also commend Suntronics on their great customer service. Being a Canadian, mail orders usually take four or five weeks to reach me. Suntronics had it at our post office in less than two. All in all, a company well worth associating with.

James Hands Calgary, Alberta

Thanks for updating that information for our readers, James. The six keyboards we chose certainly did not exhaust the market. As new information reaches us, we will be sure to pass it on to our readers. Keep us informed about what else is happening
regarding Timex Sinclair Canada. Suntronic's address is 12621 Crenshaw Blvd, Hawthorne, California 90250.

## Disk-Drives

First, let me thank you for your outstanding magazine. My question I'm sure concerns many T/S,ZX owners. For over a year there have been rumors of a disk-drive for the T/S1000,ZX81. In your third issue I read an article about microdrives for the 2000 series. Are we T/S1000 owners being phased out? I am pleased with my T/S1000 and Timex in general and would like to stick with them. I asked Timex about the "rumor" and they seemed to indicate a disk-drive was in the works. Since then I can't seem to get clear responses to the question. Do you know anything about it?
P.S. Please keep those projects coming!

William Cushman
Panama City, Florida

We have heard the "rumors" also and like you can't seem to get a clear answer from Timex. Maybe someone at Timex reading this will give us a call and set the matter of disk-drive for Timex computers straight. Until then we'll have to wait and sce.
What about one of you out there coming up with an answer to this problem - maybe a project or a simple solution!
And we intend to "keep those projects" coming. If any readers have projects they would like to share, please send them to us for consideration.

## Learning T/S BASIC

I'm interested in purchasing the book Learning Timex Sinclair BASIC by David A. Lien, which Fred Blechman reviewed in Issue 4. Will you please print the address of its publisher?

John R. Kappes
Garden Grove, California

## The original:

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## Letters

Lien's book is published by Compusoft, whose address is 535 Broadway, El Cajon, California 92021. It is available in stores for $\$ 14.95$. Hope you enjoy it as much as Fred Bleckman did.

## Spectrum Information

I am writing for information on the Sinclair Spectrum computer. Can I get a Joystick for the Spectrum? A Disk-Drive? A modem? Also I would like more information on its compatibility, capabilities for games and education, memory, graphics and price. How soon can 1 order the Spectrum and what is the subscription price of your magazine and is it monthly or weekly?

Jamie Windsor Sydney, Nova Scotia
The Spectrum is a British computer, built to work with British televisions and power supplies. Spectrum will not work in North America without many modifications.

Timex is bringing out a North American version (a much improved machine) of the Spectrum, the T/S2068. It was reviewed in Issue 4. It will take a joystick, a disk drive, a modem, and much more. As more information about the machine becomes available, we will publish it.

To subscribe to Timex Sinclair User, just fill out the card at the front of the magazine and send it in. Thanks for writing.

## 3D Xs and Os

Many of you informed us that the program "3D Xs and Os" in our September issue (TSU 1:4) was incompletely listed. In our haste to bring you this program, we omitted most of it, so that it ended with line 240 and not 1090. Timex Sinclair User apologizes for any inconvenience this may have caused. The complete listing is among the Program Printouts in this issue.

## Arcade Corrections

Numerous errors crept into Part I of Bob Fraser's "Programming Arcade Games" in our October issue (TSU 1:5). Line 40 of Figure 1 should read POKE $I+D+1,23$. The third paragraph on page 61 should refer to Figure 2A, not 3. Figure 3 should contain the line 1005 PRINT AT H,1," ". In line 40 of Figure 2, $C<>2$; in line $50, C<>29$; in line 60 , add blanks before and after the asterisk (also in Figure 2A). In line 55 of Figure $2 A, R<>1$; in line 56 , $R<>18$; in lines 58 and 59 , add three blanks between the quotation marks. Line 1006 of Figure 3 should end with a semicolon; line 2010 should contain four blanks between the quotation marks; and line 2020 should read coto 20.
As a result of these errors we have instituted another stage of proofreading to ensure that similar errors do not recur. We apologize to our readers.


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e． 0


| EOO FOR $L=1$ TO 4 <br> E10 FOR I＝1 TO 33 <br> EQ IF PEEK $(I+\bar{A})$ 〇E ANU FEEF <br> $I+G$ ）（इE THEN EDKE（I＋A），ヨ＋FEEK <br> $I+$－） <br> E SO NEXT I <br> 04 LET $R=A+E$ E <br> ESO NEKT L <br> EEG FOKE A +11 ，S7 <br> ETQ FOKE $\overline{-}+15$ ， $\overrightarrow{\text { B }}$ <br> EBQ POKE $9+1$ ， 56 <br> ESO FOKE $a+17, V$ <br> 300 FOKE $\bar{B}+13,58$ <br> 310 FOKE $a+10,27$ <br> $3 E D$ LET $R=135+$ INT（ $F N D * 4$ ） <br> 330 FRINT RT D， 9 ； 51 TO 1501 <br> 340 ERINT RT E，B； <br>  <br> 370 ERINT AT E B． <br> 3 B0 FRINT FT E1，0，工生 <br>  <br>  <br> TO 12E <br> 110 FRINT RT $10.0 \cdot \cdot{ }^{2}$ <br> 4E＇O EOTO 3 EO |  |
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More Than One Can Chew

Byteing Deeping Into Your Timex Sinclair 1000,
by Mark Harrison
(John Wiley \& Sons, Inc., \$12.95)
leave you with a worried expression, this is not the book for you.
However, it is in this section (just past the mid-point) that the most original and useful programs are found. If you've tried programming arcade games, you may have discovered a need for a timer - in real units. There it is - an elegant,
devices are excellent, but - and it's a big but - I wouldn't buy it. The last thing my bookshelf needs is another book whose title implies I can really get into my computer and whose purpose is to help me learn BASIC but whose contents break the promise of the title and whose language forces me to re-

You need a strong background in math to understand the text
concise listing (six lines) that can be adapted to your own needs.
This section also includes an overview on machine code programs. If you don't know much about this language form and would like to, this is an overview ". .. not really intended to teach the writing of machine code programs but to show the ZX81 (T/S1000) user how to execute and possibly understand other people's machine code programs."

This may work for you, but it didn't for me. If I hadn't known anything about it before I had read this section I would have hit the frustration point. Machine code programming cannot be covered in ten pages and accomplish the goals set by Harrison.
The remaining few chapters cover loading and saving, crashing and programs. In summary, I believe that this is a book to look at very carefully before you buy it. Other books do a better job in terms we can all understand. Now don't get me wrong - this is not a bad book. The tips and programming
read to make sure I really don't understand what I don't understand. This one's not for me.

- George Miller

The Anatomy of
The Ins and Outs
of the TS 1000 \& ZX 81,
by Don Thomasson
(Melbourne House, \$12.95)
$\int$ HIS BOOK will be a long awaited pleasure for anyone who wishes to soup up his T/S1000,ZX81 with internal modifications or add-on homebrew peripherals. For those of us utterly unfamiliar with electronic hardware, The Ins and Outs might be a bit rough-going at first, but the author makes every effort to present the material in terms that lead to an understanding of the concepts and projects presented. Tinkering with the innards of a computer is something that most of us are understandably nervous

# Programming Primer a Peach 

Programming Your Timex/Sinclair 1000 in basic, by Mario Eisenbacher (Prentice-Hall, \$9.95)

THE BOUNDLESS enthusiasm that Mario Eisenbacher manages to instill in his book is all too rare in the computer book industry. The typographical errors and minor inconsistencies are there but this supplementary programming manual is well laid out and somewhat more carefully planned than many of the slap-dash efforts we've seen appearing on the bookshelves in the last year or so.
Although the choice of sample programs is at times a bit unimaginative (yes folks, another version of Hangman), the author is once again saved by his technique. When you first come across a program, it is written in such a way as to include many of the typical programming errors to which the novice generally falls prey. When these faults become obvious, the reader is gently steered in the right
direction with a revised version of the program at hand. The new program is itself not usually perfect, but through several levels of correction, Eisenbacher gradually brings it all together. Another decisive point in this book's favor is the use throughout the text of boxes, offset from the body of type, containing hints, notes, rules, reminders and simple point of interest or importance which break up the book and make it a little easier to read.
As a learning tool, the T/S1000,ZX81 has always struck me as a good bet, even for children. The small size and low cost of the unit are important, as are its relative indestructibility and the straightforwardness of the BASIC language resident in the machine. In Programming Your Timex/Sinclair 1000 in BASIC, we find a book that goes hand in hand with the concept. The many exer-

## a Microcomputer

about, but Thomasson treats the subject in such a matter-of-fact way that after a few pages even the most reluctant of us will be itching to take the cover off and get inside with a soldering iron.
The first section is devoted to a careful study of the internal layout of the machine. Thomasson discusses the various signals zipping around inside the little black box, how they affect each other, and finally suggests some practical changes to the interior decor. Any of us who have suffered from the dreaded Rampack Wobble will find irresistible a project designed to install ram (random access memory) chips inside the T/S,ZX. The middle section of the book provides a concise description of the
signals available along the edge connector at the back of the machine; this leads quite naturally to the third and final portion, which deals with the addition of external circuitry to the computer. In a book as small as this one it is impossible for the author to cover every possible type of interfacing and to his credit Don Thomasson has not attempted to do so. His approach instead is to start with extremely general advice, and through selected examples of varying difficulty, lead the reader to his or her own solutions to specific application problems.
An aspect which for me justifies the purchase of The Ins and Outs of the $T S / 1000 \& Z X / 81$ is the very useful (if sometimes roughly drawn) diagrams which are to be found throughout. I was also excited by the final project in the

cises in the book are clever and well-aimed; a table of answers is provided at the back, a change from many of the textbooks currently available.
If you are unfamiliar with programming and feel a bit queasy about plunging in unassisted, I recommend Eisenbacher's book as a supplement to help you over some of the rough spots in the T/S manual. If you are seeking a text to assist in teaching children to use the T/S, ZX, this book is definitely worth considering.

book, which describes a complete control system for a model railway. This is the sort of thing that starts one thinking about the computerized home of the future; with the circuits and techniques presented here, it could be yours sooner than you think.

- T. S.
0.0


# How to program 

## Programming Arcade Games III

## Instantaneous Keyboard Response

In the third part of his series, Bob Fraser explains how to tell what key has been pressed using machine language

IN THIS SEGMENT we will look at various ways to find out which key, if any, is being pressed. In an arcade game, this information must be found quickly and efficiently. We will show you different methods of inputting. You select the one that best suits the needs of the particular game you are developing.

## How Important?

Arcade games are fun because a player's input determines the outcome of the game. Imagine playing an arcade game without player input. You helplessly watch your spaceship get bombed by enemy fire while your score remains at zero. You want to blast into hyperspace or set up a defector shield. An enemy spaceship swoops down blasting lasers at your unprotected vessel. As your only means of escape, you yank out the power supply to your computer, ending the senseless slaughter.
The above scenario is an exag geration. Most games allow for input, but if it is not done in the best possible way, the game may be ruined. Games can have too little or too much input. They can be too complicated or too simple. The input methods used in any game require careful planning.

## Selecting the Appropriate Input Keys

There are two important points to

consider when selecting which input keys to use for a game:

1. A player will become frustrated with a game that requires memorizing the use of too many input keys. Most games work best if the number of input keys is kept to four or less.
2. Input keys that have a mnemonic, symbolic or positional meaning are best. A poor selection, such as using " $Z$ " to mean right and " N " to mean left, will confuse the players and make the game more confusing and difficult.

## Keyboard Scanning Monitor Routine

One method of inputting data in a machine language program is to use a keyboard scanning routine located in the monitor. This routine returns a code in the HL register pair which represents the status of the keyboard.
The scanning routine is summarized below.
Address
Location: 699 Decimal (2BB
Hexadecimal)
Method of
Use: 205 CALL SCAN 187
2
Input: Nothing
Output: Key code stored in HL register pair (see keyboard scanning codes table).
Caution: The scanning routine uses registers $\mathrm{A}, \mathrm{B}, \mathrm{C}, \mathrm{D}, \mathrm{H}$ and L . Any numbers previously stored in these registers will be lost! If you need them for future use, save them on the stack or at a different address location in memory.
The table of key codes shows the values returned to the HL register pair by the scanning routine. Register L equals 255 only when a key has not been pressed. Therefore, a single compare instruction can determine if a key has been pressed. The following routine illustrates this method.
Example: Waiting for a key to be pressed.

## Table of Key Codes

## Returned By Scanning Routine

| Key | HL Hex. Value | HL Dec. Value | H Value | L Value |
| :---: | :---: | :---: | :---: | :---: |
| No key | FFFF | 65535 | 255 | 255 |
| 1 | FDF7 | 65015 | 253 | 247 |
| 2 | FBF7 | 64503 | 251 | 247 |
| 3 | F7F7 | 63479 | 247 | 247 |
| 4 | EFF7 | 61431 | 239 | 247 |
| 5 | DFF7 | 57335 | 223 | 247 |
| 6 | DFEF | 57327 | 223 | 239 |
| 7 | EFEF | 61423 | 239 | 239 |
| 8 | F7EF | 63471 | 247 | 239 |
| 9 | FBEF | 64495 | 251 | 239 |
| 0 | FDEF | 65007 | 253 | 239 |
| A | FDFD | 65021 | 253 | 253 |
| B | DF7F | 57215 | 223 | 127 |
| C | EFFE | 61438 | 239 | 254 |
| D | FDF7 | 63485 | 247 | 253 |
| E | F7FB | 63438 | 247 | 251 |
| F | EFFD | 61437 | 223 | 253 |
| G | DFFD | 57341 | 223 | 253 |
| H | DFBF | 57279 | 223 | 191 |
| I | F7DF | 63455 | 247 | 223 |
| J | EFBF | 61375 | 239 | 191 |
| K | F7BF | 63423 | 247 | 191 |
| L | FBBF | 64447 | 251 | 191 |
| M | F77F | 63359 | 247 | 127 |
| N | EF7F | 61311 | 239 | 127 |
| 0 | FBDF | 64479 | 251 | 223 |
| P | FDDF | 64991 | 253 | 223 |
| Q | FDFB | 65019 | 253 | 251 |
| R | EFFB | 61435 | 239 | 251 |
| S | FBFD | 64509 | 251 | 253 |
| T | DFFB | 57339 | 223 | 251 |
| U | EFDF | 61407 | 239 | 223 |
| V | DFFE | 57342 | 223 | 254 |
| W | FBFB | 64507 | 251 | 251 |
| X | F7FE | 63486 | 247 | 254 |
| Y | DFDF | 57311 | 223 | 223 |
| Z | FBFE | 64510 | 251 | 254 |
| EDIT | FCF7 | 64759 | 252 | 247 |
| AND | FAF7 | 64247 | 250 | 247 |
| THEN | F6F7 | 63223 | 246 | 247 |
| TO | EEF7 | 61175 | 238 | 247 |
| $\longleftarrow$ | DEF7 | 57079 | 222 | 247 |
| $\downarrow$ | DEEF | 57071 | 222 | 239 |
| $\uparrow$ | EEEF | 61167 | 238 | 239 |
| $\rightarrow$ | F6EF | 63215 | 246 | 239 |
| GRAPHICS | FAEF | 64239 | 250 | 239 |
| RUBOUT | FCEF | 64751 | 252 | 239 |
| " " | FCFB | 64763 | 252 | 251 |
| OR | FAFB | 64251 | 250 | 251 |

## How to progiam

| Decimal Code | al Mnemonics | Purpose |
| :---: | :---: | :---: |
| 205 | WAIT: <br> CALL SCAN | Store keyboard response in HL |
| 187 |  |  |
| 2 |  |  |
| 62 | LD A, 255 | Set register A |
| 255 |  | to 255 |
| 189 | CP L Cors | Compare L to A |
| 40 | JR Z, walt J | Jump to WAIT if |
| 248 |  | $A=L$ |

Here is another example of keyboard scanning. Suppose that a game used the 5 key to call a routine to move left and the 8 key to move right. The following input routine shows an efficient method


Table Of Key Codes Returned By Scanning Routine, continued

| Key | HL Hex. Value | HL Dec. Value | $H$ Value | L Value |
| :---: | :---: | :---: | :---: | :---: |
| STEP | F6FB | 63227 | 246 | 251 |
| $<=$ | EEFB | 61179 | 238 | 251 |
| <> | DEFB | 57083 | 222 | 251 |
| $>=$ | DEDF | 57055 | 222 | 223 |
| \$ | EEDF | 61151 | 238 | 223 |
| ( | F6DF | 63199 | 246 | 223 |
| ), | FADF | 64223 | 250 | 223 |
| " | FCDF | 64735 | 252 | 223 |
| STOP | FCFD | 64765 | 252 | 253 |
| LPRINT | FAFD | 64253 | 250 | 253 |
| SLOW | F6FD | 63229 | 246 | 253 |
| FAST | EEFD | 61181 | 238 | 253 |
| ${ }_{* *}^{\text {LLIST }}$ | DEFD | 57085 | 222 | 253 |
| ** | DEBF | 57023 | 222 | 191 |
| - | EEBF | 61119 | 238 | 191 |
| + | F6BF | 63167 | 246 | 191 |
| $=$ | FABF | 64191 | 250 | 191 |
| FUNCTION | FCBF | 64959 | 252 | 191 |
| , | FAFE | 64254 | 250 | 254 |
| ; | F6FE | 63230 | 246 | 254 |
| ? | EEFE | 61182 | 238 | 254 |
| 1 | DEFE | 57086 | 222 | 254 |
| $<$ | DE7F | 56959 | 222 | 127 |
| < | EE7F | 61055 | 238 | 127 |
| > | F67F | 63103 | 246 | 127 |
|  | FA7F | 64127 | 250 | 127 |
| \& | FC7F | 64639 | 252 | 127 |

of doing this.
Example: Input routine - $5=$ left, $8=$ right
The previous routine uses the SBC instruction to test the value of a large number. The zero flag will be set if the result of the subtraction is zero (if $\mathrm{HL}=\mathrm{DE}$ ). This is the most efficient method of testing the value returned by the scanning routine.

## Input: Using A System Variable

The system variable LAST K contains the key code of the last key pressed. This can be used for inputting the same way the scanning routine was used.
The variable LaSt K is located at address 16421. It is two bytes in length. The instruction:
LD HL,(16421)
has the same effect as CALl SCAN.
While the computer is executing a BASIC or machine language pro-
gram, it continues to send an output to the television and scan the keyboard. This is done by periodically interrupting the program and moving to a routine that produces an output display and executes the scanning routine. It is the scanning routine which updates the LAST K variable.
The example below calls a routine called PRINT only if a key has been pressed.

Input: Example using LAST K.

Decimal Mnemonics Purpose Code

42
37
64
62
255
189
196

LD, HL,(16421) Store key code in HL

LD A,255
Let $A=255$
CP L Compare L to A
CALL NZ, print Call print routine if


Monitor Decoding Routine
To print the character of the key pressed, it is necessary to decode the value returned by the scanning routine. The monitor decoding routine can be used to translate the key code into a printable BASIC code. For example:

| Key Value | Basic Code | Key |
| :--- | :--- | :--- |
| 65007 | 28 | O |
| 63485 | 41 | D |
| 64510 | 63 | Z |

The information needed to use the decoding routine is summarized below:

The BASIC codes for all of the printable characters are stored consecutively in memory starting at address location 125. The decoding routine finds the address of the BASIC code that matches the key value stored in the BC register pair.

The following input example waits for an input response, decodes the response and stores the resulting BASIC code in the A register.
Example: Decoding an input response:

| Decimal Code | Mnemonics | Purpose |
| :---: | :--- | :--- |
| 205 | LOOP: CALL SCAN | Store keyboard |
| 187 |  | response in HL |
| 2 |  |  |
| 62 | LD A,255 | Set A to 255 |
| 255 |  |  |
| 189 | CP L | Compare L to A |
| 40 | JR Z,LOOP | Continue in loop |
| 248 | LD B,H | until a key is pressed |
| 68 | CALL DECODE | Let $B=H$ |
| 77 |  | Decode input |
| 205 | LD A,(HL) | Load response |
| 189 |  | BASIC code ing A |
| 7 |  |  |
| 126 |  |  |

Address 1981 Decimal (7BD
Location: Hexadecimal)
Method of 205 Call DECODE
Use: 187
Input: Key value stored in BC register pair
Output: Address of location containing BASIC character code stored in HL

Note: Do not call the decoding routine unless a key has been pressed. If the BC register pair contains 65535 (code for no key pressed) the system will crash after entering the decoding routine.

Next month we will look at one of the most important elements of arcade games - the video display.
0.0


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## An Illuminating Idea

# Let your T/S,ZX control the blinking of the lights on your tree this Christmas. The Power Card, Dave Buckley explains, can also be used year-round for other switching applications 

THIS simple, low-cost project permits you to switch on and off under program control up to four 5 amp loads at up to 110 volts. Because of the limitations of the connectors used, the total of the four loads should not exceed 5 amps.
The Power Card is controlled via any user output port such as the Latch Card. It is designed to be plugged right into the Latch Card. An interface is required between
the Power Card and the T/S, ZX , and, in lieu of the Latch Card, any interface that will provide an 8 -bit output (one only) will do the job; there must be a dozen such devices available.
Suitable applications for the Power Card include switching lamps, aquarium heaters, electric motors, cassette recorders, and model railway points. The warning is that it should not be used to switch unattended electric heaters.

If you build it in time, you can dazzle and amaze your friends and neighbors by using your computer to control your Christmas tree lights. Used with an add-on sound board, you could even have your lights flash in time with music, such as Christmas carols.
You will see that the circuit board has been mounted in a stout plastic Perfcase; that is essential if the Power Card is to be used to switch mains voltages. On the other


## COMPONENTS

```
Qty ltem
2 16-pin dual in-line socket - SK1,
    SK2
    Perfboard 3 3/4-in. x 5-in. (10347)
    10 amp change-over 12V coil
    relays - Rly 1. . . Rly 4 (10 amp
    mains relay - VX97F)
    BC107B transistors - T ... T}
    1 Kohm resistor - R ... R
    1N914 diode - D ... D
    100m 16V capacitor - C
    6BA solder tag
    12-way connector block (5 amp
    rating)
    7-way connector block (5 amp
    rating)
    Perf. case 202-21037L type 214
    180mm. x 120mm, x 40mm. con-
    necting wire
```

To connect the Power Card to a user port you need either two 16-pin dual in-line header plugs and one 1-ft. 16-way ribbon cable or one 16 -pin DIL plug to 16 -pin plug cable assembly. The header plugs and ribbon cable should be available from any good component shop.
Note: If Vero products are not available from your local supplier, you may substitute Vector, GC or similar manufacturer's products.

hand, if you are to use it only to control your model trains, the box can be omitted and the cost of the project will be almost halved.
The Power Card is built on a standard-sized piece of Perfboard. Insert the big components in the
correct place in the Perfboard using the component overlay diagram in Figure 1 as a guide, and solder them in place. Then work your way down to the small components; it is easier to have the locations correct that way.

When all the components have been soldered in place and the excess leads have been cropped off, use a $1 / 8$-in. twist drill held in your fingers to cut the tracks in the places indicated. Although this is the opposite way of constructing things from that usually recommended, if the tracks are cut before fitting there is great difficulty in finding the correct locations.

Having fitted all the components, mount the 12 -way connector block using two 6BA nuts and bolts or stick it down using sticky pads. When it is in place, use thick insulated wire to put in the links between the connector block and the relays. Use blue for the common connectors, yellow for the normally closed ones and white for the normally open connection on each relay.

Where the links enter the Perfboard, make sure that there is a good solder connection between the link and the relay connection. For the normally open connection (white), lay an offcut of component wire along the track between the

white link and the relay connection and solder it in place to give a good, thick connection. Vero-tracks by themselves will burn out if you try to put 5 amps through them.

The Power Card uses only the lowest four bits of the output latch so you can use the upper four bits to control something else. If the unused upper four bits is routed along with the $9 \mathrm{~V}, 5 \mathrm{~V}$ and 0 V lines to SK2, you can plug in something else there - perhaps another Power Card - but in that case it would be advisable to route the unused upper four bits to the lower four-bit positions of SK2 and then the second Power Card should be identical to the first; otherwise on the second card the four base resistors would need to go to bits 4 to 7, rather than bits 0 to 3.

If you do not want to use the upper four bits, you can omit SK2 and its interconnecting wires. One point you may notice - SK1 and SK2 are one way round in the photograph and the other way round on the drawings. The drawings are correct. Having assembled all the circuit board, there must be some way of holding it in the box. A

Figure 5. Model motor control: motor onloff using one relay

piece of $3 / 8$-in. balsa, 1 -in. x 5 -in. can be stuck, using sticky pads, to the board under the connector block. That gives support for when you are connecting wires to the Power Card. Also you could stick $1 / 4$-in. x 1 -in. pieces of $3 / 8$-in. balsa underneath SK1 and SK2 to give them some support, again using sticky pads.

If you are to use the Power Card to switch only low voltages you can

leave it at that but for mains the box is needed, with the balsa feet stuck to the inside of the box.
Using more sticky pads, stick in the 7 -way connector block. File five $3 / 16$-in. slots $1 / 2$-in. deep in the back panel and make sure they are smooth and then attach a solder tag with a 6BA nut and bolt. Then cut a slot in the left-hand side of the top of the box (by SK1) for the input to SK1 - see Figure 6.



Figure 8. Alternate method motor forward/reverse/stop using two relays.


The box wiring is shown in Figure 7 and it should be done in thick wire which will carry 5 amps . Then the mains A.C. supply wires can be wired into the three connectors marked Mains A.C. In, Ground, Live and Neutral. The four loads can each be wired between one of the neutral out connectors and one of the four NO - normally open - connectors by relays.
To prevent putting any strain on
the connectors by the wires leaving the box through the slots in the back panel, tie a knot in each lead before and after it goes through the slot - see Figure 13- making sure that there is slack on the inside of the box.
Nothing could be easier to operate. Attach the 16 -pin DIL jumper cable between SK1 and the Latch Card or some other 8 -bit output port, making sure that the
orientation of the plugs is correct. If some other 8 -bit output port is used, you must make sure that the various signals and power lines have been transposed to suit SK1.
Writing zero to the port will turn off all the loads and writing a 1 to any of the low-order data bits will turn on that particular relay, e.g. POKE the port with 1 will turn on relay 1, POKE with 2 will turn on relay 2, POKE with 3 and both relay 1 and 2 will be turned on.
The Power Card will control small DC model motors easily but when that is being done the Power Card must not be connected to the mains. Figure 14 gives details.
Here is a sample program to drive Power Card using your computer and the Latch Card or interface. 10 REM ASSIGN PORT ADDRESS TO P 20 LET $P=36850$
30 REM ASSIGN MAXIMUM PAUSE time to t
40 LET T $=100$
50 Rem randomly switch each
relay
60 REM AT RANDOM TIMES
70 POKE P,RND* 15
80 PAUSE $1+T^{*}$ RND
90 GOTO 70


## Prolicet



Figure 12. Soldering relays onto boords.


Figure 13. Wire through bock panel.


Figure 14. Box wiring for low power moins lood.


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# Dr. Dan Tandberg outlines a technique useful for games and data display 

SCREENER is a short utility program written in machine code and BASIC that will let you print an entire screen almost instantaneously. It allows you to compose and test screens in ordinary BASIC print statements (lines 100 to 121). Once you're satisfied with your display, running lines 200 to 370 will place it up in the first REM statement, preceded by a 40 -byte machine code Print screen subroutine. You can then delete all the remaining lines and use this line in any BASIC program in which you need to rapidly print this particular display. This routine can be used to great advantage, even by those who know nothing about machine code programming.

To enter SCREENER you should first type in the loader routine shown in Listing 2. (Don't forget the two semi-colons in line $50-$ and be certain there are at least 40 characters after 1 Rem). Proofread carefully and then run. You'll be prompted to enter the first byte of
the machine code for the PRINT SCREEN routine shown in Listing 3. Type in the 40 numbers, left to right, e.g. 33 Enter, 33 Enter, 117 ENTER, etcetera. If all 40 bytes have been accurately put in then the CHECKSUM will equal 4220 . If not, you'll have to run it and try again. Once you've successfully entered the code, you'll see that it's been moved into the first REM statement; delete lines 10 through 80 and save to tape.
This machine code subroutine has been written in such a way that it will rapidly and sequentially print any characters placed after it until it comes to E3h (STOP), and will begin a new line whenever it comes to $76 \mathrm{~h}(=118)$. It can also be edited without "self-destructing". (See Listing 4).

Bring down line 1 and move the cursor all the way to the end of the line. Now type in 23 Xs followed by eight rows of periods as shown in Listing 1 to make space for your text. (You'll need to adjust the number of periods for longer
screens; one line of periods will hold one full line of characters; shorter lines take correspondingly less.)

Finally, carefully type in and proofread BASIC lines 100 to 1000 shown in Listing 1 and save this tape as SCREENER.

To use this program simply carry out the following steps:

1. Load SCREENER.
2. Edit whatever text or graphics characters you want into lines 100 to 121 , up to 32 characters per line. Line 100 goes to row 0 ; line 121 goes to row 21. (You'll need to put quotation marks after the PRINT and at the end of the string of characters.)
3. Press run, enter to see what your screen will look like; make any changes or corrections needed.
4. Adjust the number of periods in line 1 so there is at least one for each character and space in each non-empty PRINT line. (Extra periods won't hurt, but too few will result in a nasty crash!\}

Listing 1. SCREENER

5. Use RUN 200 to compile your text.
6. You can now execute this machine code with RAND USR 16514 or LET L = USR 16514. If you do this in the slow mode you will appreciate how quickly this subroutine prints your display
7. If you want to make further changes simply go back to Step 2.
8. Once you're satisfied with your screen, delete all lines after 1 and save to tape for use in future programs.

If you list line 1 you'll see that all the characters after the first newline byte ( 76 h ) are misinterpreted. This makes the listing look strange but doesn't interfere with execution. You will have trouble listing and working on subsequent lines after listing line 1, but run 999 will fix this. SCREENER generated subroutines work in either the FAST or slow mode.

This program can be used to produce a full screen, but you'll need to remember to add additional periods to the first line. The screens you create with SCREENER can be used in any BASIC program you write which needs an "instant" full screen display. I find these especially useful for games and in data display routines. I would appreciate hearing about any interesting applications you might develop.

# THE WORD-PROCESSING SYSTEM FOR TIMEX-SINCLAIR 

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## PROGRAT' PRRIVTCUT



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    105 FLOUTNT "* * FARADOX OF THE
TUORTMINS**""TUIN 1 STAYS ONEEA
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E म此 RET|ENE:
    30 PRINT "HOU MUCH YOUNGER I
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    40 FRINT \"INPUT SFEED OF TUI
N ESEFEED QF'LIEHT, 2Og,792 KM/H
    IS MFXETN|N!
    SB INFUT IF U
40
    E0 ELS y=U E9O79E
    BQ LET A=(1+U)/(1-U)s
```

quite minor. At speeds nearing the speed of light, however, the age difference is not only substantial but actually fantastic. The traveling twin upon his return after 16 of his own years may find that his waiting twin died eons ago!
The program opens upon loading with a brief description. Twin 1 waits on Earth; Twin 2 goes on his trip. The speed of the trip is prompted for in kilometres per second and is tested that it not equal or exceed the speed of light.
Then this speed is displayed as a percent of the speed of light and the program proceeds to compare year-by-year the traveler's and the waiter's clocks. The traveler is the reference and his journey occupies 16 years on his own clock. At the end of the trip the amount by which the traveler is younger than the waiter is cited in customary time units.
An INKEY\$ triggers for another go and an invalid input for the speed (such as a letter or keyword) terminates the program.
Submitted by John Pazmino of Brooklyn, New York.


HEXDUMP displays the contents of any portion of your T/S1000,ZX81's memory in hexadecimal. It begins by asking for the start and end addresses in decimal. The start address is rounded to the preceding eight-byte boundary to begin the display. Each line will list the contents of eight bytes, along with the address of the first byte. The display will continue to scroll up from the bottom until the end address is reached. A good area to start with is the system
variables' region (16384 to 16508) described in chapter 27 of the T/S1000 User Manual.
If you want to include a hex display in your own programs, the subroutine at line 1000 will convert any number in the range 0 to 255 to
a two characterstring of corresponding hex digits. Two calls on the subroutine (as in lines 110 to 150) can convert a two-byte value, such as an address.
Submitted by F. Barry Mulligan of Atlanta, Georgia.

|  |  |
| :---: | :---: |



M INIBREAKOUT was written in an attempt to produce a reasonably good "breakout" type arcade game without resorting to machine language programming. Type in the program exactly as shown in the listing. Be sure to use the correct graphics characters, since the CODEs of these are used to produce the correct "bounce." Proofread and EDIT out any errors, then SAVE to tape.

To play MINIBREAKOUT, RUN the program and you'll see a playing screen filled with two kinds of "bricks", a paddle (which you can move with the " 8 " and " Y " keys), and a ball. Move the paddle right or left to keep the ball in play. Each time you knock out a brick, you'll receive 10 points. When you finally "break out" to the top of the screen, you win. Whenever you miss the ball, however, the paddle moves up closer to the bricks and the game gets a bit harder. Three misses and you lose.
Submitted by Dr. Dan Tandberg of Albuquerque, New Mexico.

## How To Use This Guide

WELCOME to Timex Sinclair User's Shopper's Guide, in which we list much of the software, hardware, books and other items available for use with the ZX81, T/S1000, T/S1500 and T/S2068 computers. The listings are straightforward and there are just a few things you should know before you begin.
Each entry begins with the name of a product in boldface type, followed by a description, price information, and at least one three-digit number in parenthesis. These numbers refer to suppliers, who are listed numerically on page SG3.
Though Timex Sinclair User has endeavored to make this guide as accurate as possible, it is not meant to be a catalog, and readers should confirm price and availability of items with suppliers before ordering.
Happy browsing!

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## About

 T/S ComputersAFULLY programmable personal computer with black-and-white grapics capability, the Timex Sinclair 1000 is a computer literacy learning tool which provides the first-time user with a low cost introduction to computers. The T/S1000 is compact, lightweight and compatible with a wide range of peripherals, as well as hundreds of software packages for educational, household management, entertainment and business applications. It has a suggested retail price of \$49.95.
The Timex Sinclair 1000 has an expandable 2 K byte internal memory, and comes complete with all necessary attachments including a step-by-step instruction manual, custom-written for the first-time computer user. The instruction book includes a course in fundamental programming enabling users to develop custom programs in BASIC one of the standard languages of personal computers.
The 2 K RAM can be expanded to 16 K with the addition of memory expansion modules like the T/S1016. This optional unit allows users to extend the computer's memory for program storage, or use as a data base.

A 32 -column thermal printer is also available for use with the T/S1000, as well as other Timex Sinclair personal computers. The Timex Sinclair 2040 thermal printer incorporates a dot-matrix print mechanism with full graphics and text capability and operates at a speed of two lines per second. Graphics and text capability are available in two different modes: full-screen printing with a singlekey copy command, as well as a program-controlled printing mode which allows custom control of the printing format.

Communication with data banks and telecommunications services will be possible with the T/S1000 through the use of a communications interface device, or modem, which Timex has announced it will soon introduce.
The T/S1000 is packaged complete with all power, television and cassette recorder cables. In addition, all Timex peripheral products are designed to plug directly into the computer - an advantage over other computers which require the purchase of separate components before peripheral products can be used.
All Timex computer products are backed by a 90 -day limited warran-

ty, and a toll-free consumer hotline ( $1-800-24$ TIMEX) is available to help with consumer inquiries.

## T/S1500

The Timex Sinclair 1500, the first 16 K personal computer with a suggested retail price of under $\$ 80$, is fully programmable, with black-and-white graphics capability and an expandable memory. It features a movable typewriter format keyboard and use of either standard audio cassette or unique solid state mini-cartridge software. It has a suggested retail price of $\$ 79.95$.

The T/S1500 features a 16 K RAM that can be expanded to 32 K . The programming language is extended BASIC. A unique syntax check report codes allow users to instantly identify and correct programming errors. The graphic display area of the T/S1500 can be controlled by plot and unplot graphic commands in addition to the 22 pre-defined graphic characters.
The multi-function keyboard of the T/S1500 has 40 full-movement, typewriter-format keys with 22 graphic characters and 22 special characters. The keyboard also features Timex's unique "one touch" key-word entry, which enables each key to perform as many as six possible functions, thus reducing a great deal of input typing.

The T/S1500 is compatible with all of the peripherals and software available for the T/S1000, including the T/S1016 Memory Expansion Module and the T/S2040 Thermal Printer. In addition, all Timex
peripheral products are designed to plug directly into the computer an advantage over many other computers which require the purchase of separate expansion boxes before peripheral products can be used.

Communication with data banks and telecommunication services will be possible with the T/S1500 through the use of a communications interface device, or modem. Timex also plans to introduce special programs which will allow users to develop home shopping and banking capabilities through the use of the modem.
The T/S1500 is packaged complete with all power, television and cassette recorder cables, and comprehensive, step-by-step instruction manual.

## T/S2068

The Timex Sinclair 2068 color personal computer features a 72 K
internal memory capacity allowing word processing capabilities as well as enhanced color and sound qualities for entertainment and education applications. The 72 K on-board memory of the T/S2068 provides the user with 48 K of RAM and 24 K of ROM. The suggested retail price is \$199.95.
"Bank switching," makes it possible for the T/S2068 to work with as much as $256 \times 64 \mathrm{~K}$ memory capacity, and enables it to address or use one or more 64 K programs simultaneously. Thus, the machine can perform a large number of applications that otherwise would not be possible for a computer with an 8 -bit microprocessor.

The T/S2068 features high resolution color graphics, fullyprogrammable sound, a movable full-travel typewriter-format keyboard and a repeat feature on all 42 keys. It has upper and lower case letters, 16 built-in graphics characters and an additional 21 graphics characters which can be programmed by the user.

Video display for the T/S2068 can be achieved through the use of a monitor and/or most black-andwhite or color television sets. Another standard feature of the T/S2068 is a built-in real time clock.

The programming language of the T/S2068 is Sinclair extended BASIC. "Soft touch" key-word entry commands allow each key to perform up to six possible functions, and an exclusive syntax check-andrepeat code permits the user to identify the correct mistakes instantly - greatly simplifying procedures and increasing the amount of accessible memory.


## Suppliers

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## Software

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Edventure 3 ( 16 K ) Problem-solving. Emphasis on speed. Grades 7-9. $\$ 11.70$ (040)
Edventure 4 ( 16 K ) (Printer Optional) Develop insight, knowledge \& problem-solving skills. Grades 10-12.
$\$ 11.70$ (040)
Flashcard (16K) Memory aid and testing. Random or non-repeating. User can program material to be tested. All ages.
$\$ 11.95$ (032)
Four 16K Programs Math Tutor has five levels. TYPING SKILLS sets you against the computer at your selection of typing speed. 8IRDS swoop to attack. Intercept them with missiles. ASTRO SMASHER is a fast MC game. Dodge asteroids as you try to smash all the enemy ships.
$\$ 12.50$ (109)
Games Sampler (2K) Four introductory games. Hand-eye coordination and computer literacy promoted. Ages 6 \& up. $\$ 14.95$ (096)
Hangperson/100 (16K) User inserts own clues, subject and target. $\$ 11.90$ (040)
Making Treks ( 2 K ) Four adventures featuring different geographical settings. Age 10 and up.
$\$ 14.95$ (096)
Mind Vs. Machine ( 2 K ) Emphasizes logic in four game formats. Ages 10 \& up. $\$ 14.95$ (096)
$\mathbf{1 , 2 , 3} \mathbf{G O}(2 \mathrm{~K})$ Game format. Learn basic computer skills plus counting, spelling, the alphabet and left and right. Ages 4-8. \$14.95 (096)
Power Pak 1 ( 2 K ) Contains a calculator, bar graph generator, banner, and a polynomial equation grapher. $\quad \$ 9.95$ (080)
Presidents (16K) Ouizzing on the presidents and their terms of office.
$\$ 10.95$ (080)
Punctuation Master ( $\mathbf{1 6 K}$ ) Teaches the basic rules of punctuation using periods, question marks and commas. Practice exercises with a timed test.
$\$ 10.95(080)$
Quiz All $(\mathbf{1 6 K})$ Timed quizzes of general knowledge, reasoning, English \& maths. $\$ 11.90(040)$
Signals \& Morse Code (16K) Learn and practise and test Semaphore, 8linker Lights and Morse Code. Graphics and audio. Messages can be inserted by user.
$\$ 14.95$ (032)
161 K Programs ( 1 K ) Game format, plus tips on using the T/S1000 in education. $\quad \$ 8.00$ (089)
Statehood Quiz (16K) Three quiz programs relating to all 50 states. Ouestions on capitals, birds, mottos \& more. All ages. $\$ 12.95$ (083)
States and Capitals ( 16 K ) Three options of review: name the capital of the state given, name the states for the capitals or a random combination of the above.
$\$ 12.95$ (080)
Superdoodles (16k $)$ Drawing program has a fast and slow '"pen". $\$ 9.95$ (080)
The Flight Simulator ( 16 K ) With full controls, instrumentation and a view of the horizod Hee the radio beams \& radio compass to navigate Avoid hazards near the landing field. Promotes understanding of air flight. $\$ 19.95$ (080)

Tutor (16K) (Printer Optional) User enters text and/or questions in true-false, multiple choice or direct answer formats. Readable screen inputs optional. $\$ 10.00$ (also on T/S2068) (049)

## Languages

Conversational French ( $\mathbf{1 6 K}$ ) Teaches the basic useful words and phrases of the French language. Over 240 words and 50 phrases.
$\$ 10.95$ (080)
Conversational German ( 16 K ) Teaches basic useful words and phrases of German. Over 240 words and 50 phrases available. $\$ 10.95$ (080)
Conversational Spanish ( 16 K ) Teaches the basic useful words of Spanish. Over 240 words and 50 phrases.
$\$ 10.95(080)$
Countdown/302 Similies ( 16 K ) 10 -question quizzes. 3 skill levels. Ages 9-16. $\$ 11.90$ (040)
Countdown/304 French Review ( 16 K ) Tests verbs, nouns \& adjectives in 10 -question quiz format. Suitable to end of first year of study.
$\$ 11.90$ (040)
Der Student ( $\mathbf{1 6 K}$ ) Review elementary vocabulary \& grammar of German. 18 lessons. High school through college.
$\$ 24.95+\mathrm{p} \& \mathrm{~h}(013)$
Hebrew Tutor I(16K) Learn Hebrew alphabet, vocabulary, \& pronunciation. Game format. 60 words. One to 10 players. Beginners. $\$ 7.50$ (020) Highschool French (N/A USA) (16K) Teach and test verbs, pronouns, adjectives. Vocabulary of words and common expressions. $\$ 11.90$ (040)
Intermediate English 1 (N/A USA) (16K) Game format. Drills meanings, parts of speech, similies and anagrams. $\$ 11.90$ (040)
Intermediate English 2 (N/A USA) (16K) Game format. Drills definitions, parts of speech, similies, anagrams, idioms, opposites, spelling and "odd word out".
$\$ 11.90$ (040)
Language Usage (16K) For grades four through 12. Designed to help improve scores on standardized achievement tests. Records on work done, helps identify troublesome areas. \$9.95 (080)

## Math

Addition ( 1 K ) Listing. Drill for children. $\$ 1.00(040)$
Algebra ( 16 K ) User enters up to 20 formulae; computer solves using input data. Includes "Electronic pac" - solves electronics calculations. $\$ 14.95$ (084)
Algebra I ( 2 K ) Find the greatest common denominator, solve the roots of a quadratic equation and linear equatlons in up to 10 unknowns.
$\$ 10.95(080)$
Algebra II ( 2 K ) Performs functions on matrices. Finds the number of combinations or permutations of a set.
$\$ 10.95$ (080)
Angles 201 ( $\mathbf{1 6 K}$ ) Practise using a protractor (not included).
$\$ 11.90$ (040)
Bell Curve Generator ( 1 K ) Listing. Generates a normal frequency curve. $\$ 1.00$ (040)
Cayley's Sextant ( 1 K ) LIsting. $\quad \$ 1.00$ (040)
Course In Hypercube Theory ( 16 K ) Listing. $\$ 4.76$ (040)
Countdown/301 ( 16 K ) Multiplication tables. Ouizzes of 10 questions. 3 skill levels. Any age. $\quad \$ 11.90$ (040)
Tivision Primer ( $\mathbf{1 6 K}$ ) Defines and explains vears Test problems given. 2.7 years.
$\$ 9.95$ (050)

Doobarry Domino The Counting Phenameno ( 16 K ) For pre-schoolers. Graphics, music help them learn the numbers 1 to 10.
$\$ 9.95$ (080)
Easy Math (16K) (Printer Dptional) Calculator format: type in equations, the computer does the rest. Produces columnar output. Demo program included.
$\$ 9.95$ (079)
Fundamentals Of Math ( 16 K ) For grades 1 through 8. A progressive series of drill, practice, and review sessions. Graded. 80\% score promotes the student to the next level. Up 108 levels. Answers corrected.
$\$ 9.95$ (080)
Geometry (16K) Menu ol 21 shapes. Prompts for data, displays areas, volumes, perimeters \& circumferences for 2 - and 3 -dimensional tigures.
$\$ 14.95$ (084)
Geometry $\mathbf{1}(\mathbf{2 K})$ Find the area of a polygon. Solve the unknown given 3 paris of a triangle. Convert radians to degrees and back. \$10.95 (080)
Graphic Trig (16K) Plots data, scales display and does rectangular to polar conversion. $\$ 5.95$ (084)
Graphs 202 (16K) Plots any $X$ or $Y$ function over range of user-defined values. High school level.
$\$ 11.90$ (040)
Hamilton Display ( 16 K ) Listing. Generates and displays Hamilton paths on a forgetful functional representation of a 4 -dimensional cube.
$\$ 1.90$ (040)
Hamilton Path Generator ( $\mathbf{2 K}$ ) Listing. Generates paths along edges through each corner once on hypercubes.
$\$ 1.00$ (040)
Hyperbolic Spiral ( $\mathbf{1 K}$ ) Listing. $\$ 1.00$ (040)
Hypocycloids ( 1 K ) Listing. $\quad \$ 1.00$ (040)
Intermediate Maths 1 (N/A USA) ( $\mathbf{1 6 K}$ ) Multiplication, division, highest common factor, lowest common multiple, functions with fractions.
$\$ 11.90$ (040)
Intermediate Maths 2 (N/A USA) (16K) Multiplication, division, highest common factor, lowest common multiple, functions with fractions, areas, perimeters, simple equations, percentages, sets \& Venn diagrams
$\$ 11.90$ (040)
Jogmath (16K) (Printer Dptional) Basic math skills. Simulated race against the computer or another person. Selectable number range and time allowed for answers. "'Joggers'" answer questions to complete the race From Kindergarten to grade 7. $\$ \$ 12.75+\$ 1.25 p \& n$ (117)
Lissajous Flguref(n) Listing. $\$ 1.40$ (040)
Long Division (1 K) Listing. Over 475 decima places.
Make Math (1 $\mathbf{K}$ ) 1 earn mathematical concepts by application of patyitis and rules. Analogy with repeating decimals. Listing.
$\$ 2.90$ (040)
Math Facts Lab ( 16 K or 64 K ) A drill program for addition, multiplication, subtraction, division. Program grades responses, displays answers. Guide included. For grades 1-6.
$\$ 19.95+\$ 2$ p\&h (001)
Math 1 ( $\mathbf{1 6 K}$ ) Two tapes, 16 lessons \& games. Addition, Subtraction, Multiplication \& Division for ages $6-8$. Includes workbook \& guide for parent/teacher.
$\$ 24.95$ (032)
\$29.95 (074)
Math 2 (16K) Two tapes. 16 lessons \& games. Addition, Subtraction, Multiplication \& Division for ages 7-9. Includes workbook \& parent/teacher guide.
$\$ 24.95$ (032)
$\$ 29.95$ (074)
Math 3 ( 16 K ) Two tapes, 16 lessons \& games. Addition, Subtraction, Multiplication \& Division for
ages 8-10. Includes workbook \& parent/teacher guide.
$\$ 24.95$ (032)
$\$ 29.95$ (074)
Math 4 (16K) Two tapes, 16 lessons \& games Addition, Subtraction, Multiplication \& Division for ages 9-11. Includes workbook \& parent/teacher guide.
$\$ 24.95$ (032) $\$ 29.95$ (074)
Math 5 ( $\mathbf{1 6 K}$ ) Two tapes, 16 lessons \& games. Addition, Subtraction, Multiplication \& Division for ages 10-12. Workbook \& parent/teacher guide included.
$\$ 24.95$ (032)
$\$ 29.95$ (074)
Math 6 (16K) Two tapes, 16 lessons and games. Addition. Subtraction, Multiplication \& Division for ages 11-13. Workbook and parent/teachers guide included.
$\$ 24.95$ (032) $\$ 29.95$ (074)
Math Quiz (16K) Do up to 50 problems in your choice of Addition, Subtraction, Multiplication or Division. Six levels. Grade school.
$\$ 9.95+\$ 1.00$ p\&h (036)
Mind Bogglers ( 2 K ) Four mathematical puzzles. Analytical \& spatial skills. Ages 10 \& up.
$\$ 14.95$ (096)
Multiple Regression (16K) Listing.
$\$ 5.70$ (040)
Multiplication Primer ( $\mathbf{1 6 K}$ ) An introduction to multiplication. 2-7 years.
$\$ 9.95$ (050)
Multiplication Tables ( 16 K ) Choose multiplier for up to 50 problems. Mistakes and corrections listed. $7-12$ years.
$\$ 9.95+\$ 1.00 \mathrm{p} \& \mathrm{~h}(036)$
MXP-E (16K) Use up to 100 formulae, Preloaded with basic Engineering formulae. Usercontrolled. Auto-scaled. Cartesian \& Polar graphs. Guide included.
$\$ 15.95$ (087)
MXP-M (16K) Contains basic math formulae. Capacity to work with up to 100 tormulae. Usercontrolled. Polar and Cartesian graphs, autoscaling. Guide included. Students \& professionals. $\$ 15.95$ (087)
MXP-O (16K \& up) (Printer Dptional) Allows manipulation and solution of up to 100 tormulae. Expressions user definable. Cartesian or Polar graphs. Guide included. Students and practical applications.
\$15.95 (087)
Primary Arithmetic (N/A USA) ( 16 K ) Addition, Subtraction, Multiplication \& Division in three levels. Animated reward. $\$ 11.90$ (040)
Prime Numbers ( 1 K ) Listing. Generates primes from 3 to 10 million. Checks numbers for primes.
$\$ 1.00$ (040)

## Rhodonea (Rose) Curve ( 1 K ) Listing.

 $\$ 1.40$ (040)Senior Level Maths Revision (N/A USA) ( $\mathbf{1 6 K}$ ) Matrix multiplication \& inversion; multi base arithmetic; calculus differentiation \& integration. 30 question timed tests. $\quad \$ 11.90$ (040)
Sift I Statistical Interactive-Analysis for Timex Computers Vol. I ( 2 K ) 16 routines include: regressions, analyses of variance, sample tests, correlation analyses \& probability evaluation. 92 -page text/manual included.
$\$ 19.95$ (014)
Sift II Satistical Interactive-Analysis for Timex Computers Vol. II ( $\mathbf{1 6 K}$ ) Twenty statistical routines: plots, regressions, analyses of variance, sample tests, correlation analyses \& probablities. 120 -page manual included. Students, educators, engineers \& businessmen. \$29.95 (014)
Spectrex ( 16 K ) Creates three dimensional perspective. Changeable angles. Draw, erase, and dot functions. Listable \& modifiable. Requires only elementary knowledge.
$\$ 15.95$ (087)
Subtraction ( 1 K ) Listing. Drill for chilaren.
$\$ 1.00$ (040)


Super Math ( $\mathbf{1 6 K}$ ) Five levels of difficulty in the four functions. Graphic display. Grades tor each ten problems. $\$ 14.95$ (080)
Syncmath (16K) Math quizzes with 3 levels of difficulty. Game rewards double as keyboardtrainers. 6-16 yrs.
$\$ 7.95$ (090)
Times Tables ( 1 K ) Listing. Multiplication tables.
$\$ 1.00(040)$
Times Tables $(2 \mathrm{~K})$ Drills any table. Unlimited test questions. 6-8 years.
$\$ 5.75$ (050)
Total Triangles ( 16 K ) Gives the surface area for length. Gives weights for metal constructions. Encompasses the subject of triangulation.
$\$ 9.95$ (080)
Trig Teacher ( $\mathbf{1 6 K}$ ) Learn basic trigonometry. Requires some basic math background. Includes instruction sheet. Game format. $\$ 9.95$ (030)

World's Most Magic Square (1K) Listing. 8 $\times 8$ "magic square"' $\$ 1.00$ (040)
World's Most Magic Square ( 1 K ) Listing. $16 \times 16$ "magic square".
$\$ 1.90$ (040)

## Music

Chord Finder ( $\mathbf{1 6 K}$ ) Input your notes, computer will name the chords with those notes.
$\$ 5.95$ post-paid (072)
Elementary Music Theory \& Ear Training ( $\mathbf{2 K}$ or 16 K ) Uses text, graphics \& sound generation to futor drill \& practice note recognition, intervals \& melodic dictation. Several programs. 7 to adult.
$\$ 7.95$ (028)
Guitar For Beginners (16K) Teaches the parts of the guitar, basic chords, bar chords, and chord progression. $\$ 10.95$ (080)
Music Educator ( $\mathbf{1 6 K}$ ) Teaches the notes of the scale, name and timing of notes. Graphics. For beginners.
$\$ 9.95$ (080)
Musical Scales ( 16 K ) Shows any one of 8 scales in any key. Displays diagrams tor guitar. Identifies tonic notes. Machine code. $\quad \$ 9.95$ post-paid
Music Tape ( 2 K ) Contains four programs. Turn * the computer into a 2 -octave instrument. A 12-tone calculator. A chord-finder from single notes. Transpose any chord progression to any other key.
$\$ 5.95$ post-paid (072)
16 Program Music Course (16K) Complete theory workbook: note, key, chord \& clef recognition \& instrumental drills. Two levels - each 16 programs. Beginner through intermediate. $\$ 169.00$ (019)

## Programming

Basic BASIC (2K) Step-by-step guidance to writing your own computer game. Includes blank tape and workbook in addition to program cassette. Age 12 \& up.
$\$ 17.95$ (096)
Basic Course Solutions (1K) Presents solutions to end-ot-chapter exercises in the Complete Sinclair ZX81 and Timex TS1000 Basic Course
(Melbourne House). Demonstrates chapter content. Produces 28 hard-copy listings. $\quad \$ 5.00$ (011)
Equational and/or Touchstone ( 1 K ) Listing. How to construct equational and/or program lines. $\$ 1.00$ (040)
Fill Screen/Inverse/Memory Left (16K) Three sub-routines, common to any toolkit, listed and explained for the beginning machine language programmer. Good BASIC knowledge recommended.
$\$ 9.95$ (102)
Gridlock (2K) Third in computer literacy series. Four games teach uses of graphs, plots, screen display and Cartesian coordinates. Graphic display of any valid BASIC equation. Age 10 \& up.
$\$ 14.95$ (096)
Kids Educational Pkg. (1K or $\mathbf{1 6 K}$ ) Listing or cassette. Introduce $2-4$ yr.-olds to computer keyboard response.

Listing $\$ 2.00$; cassette $\$ 9.95$ (029)
Linear Search (16K) In -depth treatise on a Machine Language programming technique for searching data. Concept fully explained. Construct a very fast and highly personalized data base program.
$\$ 4.95$ listing and test.
$\$ 9.95$ with cassette ( 100 )
Multiprogram Demo (16K) Tutorial: Move blocks of data in your RAM. Write simple M/C routines to hold several BASIC programs in memory simultaneously. Booklet plus tape fo four games. Intermediate programmers.
$\$ 10.95$ (090)
Snake Eyes (2K) Develop computer literacy. Probability theory and random generator featured Game format. Second in series following "Turning the Truth Tables' ' . Age 12 \& up. $\quad \$ 14.95$ (096)
The Computer Coach ( $\mathbf{1 6 K}$ ) Teaches the fundamentals of a computer system. Self-instructing.
$\$ 10.95$ (080)
Timex Sinclalr Basic Course ( $\mathbf{1 6 K}$ ) Manual and 2 tapes. Complete BASIC instruction, includes self-testing. Beginner to advanced. $\$ 24.95$ (032)
Tiny Logo ( 16 KK ) A sub-set of MIT LOGO. Teaches children computer programming concepts.
$\$ 19.95$ (032) (041)
T/S Tutor ( $\mathbf{1 6 K}$ ) An introduction to the functions of the T/S1000, ZX81 keys in all 4 modes Defines and explains for novices.
$\$ 6.95$ (004)
Turning The Truth Tables (2K) Game format. Learn and/or, greater than/lesser than and logical relations. Beginners - age 12 and up. $\$ 14.95$ (096)
ZXData Finder ( 16 K ) Detailed tutorial text. High capacity information storage and retrieval tool. Example of such BASIC concepts as storage. retrieval and data base design. Several search techniques. Text presents advanced BASIC program methods. Intermediate level.
$\$ 9.95$ listing and text.
$\$ 14.95$ with cassette (100)
ZX Phone Book ( 16 K ) A 720-name telephone directory that serves as an example in teaching elementary level programmers BASIC file management and search techniques. Illustrates $A D D$, ALTER. DELETE and elementary search mechanisms.
$\$ 4.95$ listing and text.
$\$ 9.95$ with cassette (100)

## Reading

[^1]4-Program Speed Reading Course (16K) Four 16 K programs. Complete instructions. Actual mechanical techniques are synthesized via your computer. Demonstrates basic concepts needed to improve your reading skills and speed.
$\$ 14.95+\$ 1.50$ p\&h (016)
Rapid Read (16K) Tachistoscope method. Speed \& comprehension developed. Drills scored. automatic pacing. Charts progres. All ages, advanced reading skills. Includes users guide.
\$19.95 (087)
Reading Lab ( $\mathbf{1 6 K}$ or $\mathbf{6 4 K}$ ) Improve reading speed and understanding using the Tachistoscope method. Guide included. Reading material can be changed by user. For grades 1-6.
$\$ 19.95+\$ 2.00$ p\&n (001)
Word Play ( 16 K ) Four programs. JARGON generates jargon words. ANIMAL is a game that teaches all about animals. STORY uses input names, places, etc. in computer-generated stories HAIKU composes poetry. All ages. $\$ 10.00$ (101)
Words Quiz Vol. 1 ( 16 K ) Two levels, fifty words. Choose the correct definition. $\$ 7.95$ (083)
Word Quiz Vol. $2(16 \mathrm{~K}) \quad$ Two levels, 50 words Choose the correct definition. $\quad \$ 7.95$ (083)
Word Quiz Vol. 3 ( 16 K ) 50 words, two levels. Choose the correct definition.
$\$ 7.95$ (083)

## Religious Instruction

David \& Goliath (2K) Game features Bible story questions. Flipchart included. Child to young adult.
$\$ 12.95+\$ 1.50$ p\& (012)
Proverbs (16K) Game format teaches 60 Biblical Proverbs. 6 levels of difficulty. $\$ 7.50$ (020)
The Ark ( 2 K ) Game featuring questions about Noah's Ark. Flipchart included. Children to young adult.
$\$ 12.95+\$ 1.50$ p\&n (012)

## Science

Astronomer's Guide ( $\mathbf{1 6 K}$ ) Contains Astromap, glving access to information on 800 stars and other celestial objects, and conversion - an astronomical time and coordinate conversion program for the experienced astronomer. Seven-choice menu.
$\$ 14.95$ (080)
Atomic Configuration (16K) Drill on nuclear and electronic configurations. Game format. 1-6 players. Ages 16 \& up.
$\$ 11.90$ (040)
Compound Chemlstry (16K) Game format. Use qualitative analysis to identify substances. 1-6 players. High school +.
$\$ 11.90$ (040)
E.E.I - Filter Design (16K) An aid for engineers and students. Provides information on bipass, low-or bi-pass filters. Plots available of all design criteria.
$\$ 12.95(080)$

## Chemistry

Forensic Chemistry (16K) Detective game format employing qualitative tests. Highschool level \& up. $\quad \$ 11.90$ (040)
Introduction To Chemistry ( $\mathbf{1 6 K}$ ) Threepart self-paced course. Teaches the basics. Lessons, reviews, self tests and a dictionary. $\quad \$ 10.95$ (080)

## Physics

Countdown/303 Integral Physics
(16K) Quizzes on topic of integral physics. 3 skill levels. Ages 16-18. $\$ 11.90$ (040)
Hangperson/ 101 Electricity ( 16 K ) Graphic or verbal clues to 50 words \& phrases related to electricity.
$\$ 11.90$ (040)
Hangperson/ 102 Forces (16K) 50 words or phrases related to forces. Verbal and graphic clues.
$\$ 11.90$ (040)
MXP-P (16K) Contains basic physics formulae. Manipulate and solve up to 100 expressions. Graphs in Cartesian or Polar, auto-scale. Guide included. Students and professionals. $\$ 15.95$ (087)
The War Game ( 16 K ) Examines the effects of an atomic explosion on a city through variables of bomb size, distance from target \& wind speed. Recommended for adults only.
$\$ 15.90$ (040)

## Biology

Hangperson/104 (16K) Verbal \& graphic clues to 50 words \& phrases related to respiration, the skeleton and reproduction. Ages 16 \& up. $\$ 11.90$ (040)
Hangperson/105 (16K) Graphic \& verbal clues to 50 words \& phrases relating to biology. Ages 16 \& up. $\$ 11.90$ (040)
Hangperson/106(16K) Verbal \& graphic clues to 50 words \& phrases relating to animal biology. Ages 16 \& up.
$\$ 11.90$ (040)
 clues to 50 words \& phrases relating to plant and animal biology. Ages 16 \& up. $\$ 11.90$ (040)

## Spelling

Capitalization Master ( $\mathbf{1 6 K}$ ) Reinforces correct capitalization rules for study or review. Menudriven.
$\$ 10.95$ (080)
Flash Spelling (16K) User enters up to 50 words to be tested. Misspelled words may be displayed with correct spelling. Grade school to Jr. High.
$\$ 9.95+\$ 1.00$ p\&h (036)
Hangman Vol. 1 (16K) 50 words, game format. $\$ 7.95$ (083)
Hangman Vol. 2 (16K) 50 words, game format.
$\$ 7.95$ (083)
Hangman Vol. 3 (16K) 50 words, game format.
$\$ 7.95$ (083)
Scramble ( 16 K ) Computer acts as a "moderator"' between two human players. Computer jumbles words. Players earn points by unscrambling the words against a clock. Penalties for Invalid or misspelled words. Select difficulty and duration. Very fast. $\$ 11.95+\$ 1.50$ s $\& \mathrm{~h}$ (106)
Spelling Bee (16K) 25 sets of 5 words per level. Each set has one misspelled word to find and correct. Program tracks and lists words. $\$ 9.95$ (080)
Spelling Primer ( $\mathbf{1 6 K}$ ) Features 10 pictures and user participation. 2 to 7 years. $\$ 9.95$ (050)
Word Quest ( 16 K ) Words are scrambled. Player must guess against the clock. 99-word vocabulary.
$\$ 9.95$ (080)

## Utility (Teacher's)

Class Records (16K) Written by teachers. Menu driven. Practical and efficient record system.

Gradebook ( $\mathbf{1 6 K}$ ) (Printer Optionál) Exam and course performance analyzer and record. Statistical analyses and other useful options.
$\$ 9.95+\$ 1.00 \mathrm{p} \mathrm{\& h}$ (036)
Grade Book ( 16 K ) (Printer Optional) Records up to 40 students per class. Unlimited classes. 30 grades per student. Weights grades. Lists all by student. 14-page manual
$\$ 14.95+\$ 1.00$ s\& (114)
Grade Master (16K) Student record. Average, high \& low marks displayed. Class lists \& averages. Self-saving.
$\$ 15.00$ (051)
Teacher's Gradebook ( 16 K ) Records class records. Averages and weights. Personal Pertormance Factor. Suggests report grades. Class or individual. Includes maintenance routine.
$\$ 9.95$ (080)
Teacher's Gradebook (32K) (Printer Optional) Class records of tests, performance, homework, averages. Suggests student report grade. Menu-driven. Alphabetizing, maintenance routines \& other options.
$\$ 24.95$ (052)

## Games

## Action/Arcade Games



Asteroids ( 16 K, graphics pad) Destroy incoming asteroids. Rotate, thrust and fire.

Attack Force ( 16 K ) Hold off the invasion while the planetary force fields charge up. Shields, mobility and rockets against teleportation, photon torpedoes and bombs. $\$ 11.95+\$ 1.50$ s $\& \mathrm{~h}(106)$ B-29 Bomber ( $\mathbf{1 6 K}$ ) Bomb the stationary of moving tank. Cucved bomb path. Ages 7 and up. $\quad \$ \quad \$ 7.95+$ s\&h (025) Bat Cage ( 2 K ) Thity-six levels of play. Cata the egg and put the bat in the cage. Then fight on the other bats tyying to rescue the caged bat.
Bigflap Attack (16R) Defend yourself against the giant birds. Ten levels ot play. $\quad \$ 12.95$ (080)
City of Xon ( $\mathbf{1 6 K}$ ) 3-0 flying \& shooting game similar to Zaxxon arcade game. Listable. All ages.
$\$ 21.95$ (008)
Deep Space (16K) Seek out and destroy enemy invaders in your sector. $\$ 5.95$ (083)
Defender ( $16 \mathrm{~K}, \mathrm{graphics}$ board) Shoot down the attackers trom the side of the screen. Move up, down and tire.
$\$ 10.30(040)$
Demolisher ( $\mathbf{1 6 K}$ ) Demolish the growing wall betore it gets to you. $\$ 11.70$ (040)
Demolisher/Alr Attack (16K) Two action games.
$\$ 17.20(040)$
Demolition/Ten-Pin (16K) Destroy the wall betore the moving ball reaches it. Turn your computer into a bowling alley. $\$ 9.95$ (074)
Earthquake ( $\mathbf{1 6 K}$ ) Outrun the tumbling building blocks. Ages 7 and up. $\quad \$ 7.95+$ s\&h (025)
Fortress of Zorlac ( $\mathbf{1 6 K}$ ) Command your fleet ot spaceships to rid the galaxy ot the dreaded alien Zorlac. Fast action. $\$ 10.95$ (080)
Frogger (16K) The arcade game without thed sound eftects.

Galaxy Invaders (16K) Battle with swooping invaders.
$\$ 14.95$ (032)(041)

Galaxy Warrior/Star Trak (16K) Detend your star base and seek the enemy throughout the galaxy.
$\$ 16$ (040)
Grand Prix ( 16 K ) You are a driver in a race. controlling speed, gear changing and breaking. Random hazards generated by the computer challenge your ettort to complete the race intact.
$\$ 14.95$ (111)
Graphics Ladders (16K, graphics board) Get down the ladders and bury the enemy on your way.
$\$ 11.80$ (040)
Hopper ( 16 K ) Like the arcade game Frogger.
$\$ 11.70$ (040)
Intruder Alert (16K) Two-player action. Escape from the guardian robots. Shoot and move in eight directions. User defined specitications. Machine code portions. $\$ 14.95+\$ 1.50$ p\&h (099) Invaders ( 16 K ) Ten skill levels with scoring.
$\$ 8$ (040)
Invaders (16K) Screen yourself from bombing aliens. Ten levels of play; all machine code. Onscreen scoring.
$\$ 14.95$ (032)(04t)
Invasion Force ( $\mathbf{1 6 K}$ ) Blast away at the mother ship - carefully machine code action. $\$ 14.95(032)(074)$
Keystroke Management (2K) Four office environment games: Musical Desks, Corner Ottice, Ofice Automation and Go To The Top. $\$ 14.95$ ( 096 (1)

## Krazy Kong (16K) Rescure Jane and avoid the

 barrels. Then topple Kong.$\$ 11.70$ (040)
Lander ( $\mathbf{1 6 K}$ ) Three play levels, tive screens per level. Multiple targets. Land betore you crash or run out of fuel.
$\$ 10$ (057)
Laser Wars (1K) Fire at the invader. Good graphics. $\quad . \quad$ listing $\$ 1.80(040)^{4}$

## Semnieente of Demadili (2K)

## Linmacons(IK) diotine © (010)

ML Asteroids ( $\mathbf{1 6 K}$ ) Complexity increases as you play. Solit the rocks with hasers $\$ 1.95$ (058)
ML Raiders (18K) All machine code. Sight on the alien raider and blast it out of the $\$ 4.95$ (058)
Mad Dog Tank Blaster ( 16 K ) Entertaining and instructional. Learn to program graphics as you play. Plant a land mine in the tank's path as you avoid being shot or run over. $\$ 4.95$ (listing \& text) $\$ 9.95$ (listing, text \& cassette) (100)
Marine Rescue ( $\mathbf{1 6 K}$ ) Race against time and sharks to save the crew of a stricken submarine.
$\$ 9.95$ (032)
Missile Launcher (18K) Use your 15 missiles to destroy the enemies' 5 munition dumps.

## Mugsy (16K)

Murgatroyds (16K)
$\$ 11.70$ (040)
$\$ 11.80$ (040)
Murgatroyds Revenge (16K) $\quad \$ 11.80$ (040)
O-Bliterat \& Dire Straits (1K) Clear the screen within the time limit. Steer around obstacles.
$\$ 2.80$ listing (040)
Panzer SS(16K) Shoot enemy tanks.
$\$ 7.95(009)$
Pilot (16K)
$\$ 11.80$ (040)
Pinball ( $\mathbf{1 6 K}$ ) Plays like a real pinball game. All machine code.
$\$ 12.95$ (080)
Pinball Wizard ( 16 K ) Fast-action pinball game simulation. Complete with ball-return, shooter, flippers, bumpers, midge, trapdoors, bonus points and more. Records high scores. $\$ 14.95+\$ 1.00$ s\&h (114)


Ram Runner ( $\mathbf{1 6 K}$ ) 26 levels of player ability. Ram other runners without running into an obstacle.
$\$ 12.95$ (080)
Return From Space (16K) Come home without hitting a star or running out of tuel.
$\$ 11.70$ (040)
Koadhog ( 16 K ) A three-dimensional mightdriving game. Avoid accidents and watch your cost per mile. $\quad$. $\$ 2$ listing (048)
Scyon's Revenge (16K) The Scyons are back for more action. $\$ 16.90$ (040)
Shootist (1K) A shooting gallery
$\$ 1.80$ listing (040)
Space General (1K) Starship vaporizes aliens with cannon tire. User watches the action.
$\$ 1.80$ listing (040)
Space Gunner (2K) Uses only two tingers ix shoot down space ships. $\$ 1.80$ listing $(040 \mathrm{C}$
Space Gunner ( $\mathbf{1 6 K}$ ) Fry through the complex space maze attacking fleets of hostile invaders. $\quad \$ 9.95$ (037)
Space Intruders ( $\mathbf{1 6 K}$ )
$\$ 11.80$ (040)
Space Invaders ( $\mathbf{1 6 K}$, graphics board) Improved characters. One or two players. On-screen scoring and high score.
$\$ 10.30$ (040)
Space Invaders ( 16 K , graphics board) Features autorepeat and on-screen scoring. For two players.
$\$ 11.80$ (040)
Space Trek (16K) $\quad \$ 14.95$ (076)
Sparks! (18K) Multiple screens and difticulty evels. All machine code. Rescue people from the H00-story skyscraper fire.
$\$ 9.95$ (099)
Star Battle (16K) Save Earth from the Scyons. Ages 15 and uo $\$ 16.90$ (040)
Stax-6ity (10K) Pity oter oruisen theaugh Ethe coromtes, avoruthy space jume.

Starhike ( $\mathbf{1 6 K}$ ) Battle hostile warships on four levels of difficulty. Graphics and status display. All ages.
$\$ 6.95$ (004)
Starship Invasion (16K) Oestroy Invisible enemy bases on a vital mining planet. Realistic graphics and total mobility. Survivor's abilities rated by the computer. $\$ 11.95+\$ 1.50$ s\&h (106)
Stormlander $3(16 \mathrm{~K}) \quad$ Make an emergency landing ot your airliner. Three screens of action. Four levels. Speed and variables change with level.
$\$ 9.95$ postpaid (090)
Strategy At Sea Three games. Shipwar (Battleship), Convoy (a shooting gallery) and Sub Hunt (track and sink 5 subs).
$\$ 10$ (057)
Qubseanch (16K) You arein a sumace vesselp pattling an airerath and a submarime.

Scomatil. 62 Histing 1048 )
Super-Slide (16K) Race your bob sled, avoid obstacles. Make it to the Olympics, compete with 80 others. Special 'gold medal' display. $\$ 9.95$ (090)
Tai ( $\mathbf{1 6 K}$ ) Escape in your spaceship. Avoid obstacles.
$\$ 11.70$ (040)
Tailgunner ( 16 K ) You control a rebel space gun. Destroy as many ot the Imperiat Fleet as you
can before you go into hyperspace. $\$ 14.95$ (111)
The Invaders ( $1 \mathbf{6 K}$ ) You can fire while moving. All in machine code.
$\$ 11.90$ (040)
Timeblasters ( 16 K ) Space battle game features time acceleration on missing shots. Blast a space station to slow it down again. Start with 5 ships. All ages.
$\$ 12.95$ (010)

## Winged Avenger ( 16 K )

$\$ 14.95(076)$
Working Mother's Dilemma (2K) Four games. Mad Dash, Shopping Mall, Carpool and Harried Housewife.
$\$ 14.95$ (096)
Z-Trek (16K) Seek and destroy up to 200 Zylons. 24 -line display, moving graphics. Some machine code.
$\$ 9.95$ (099)
Zor (16K) Two mighty robots join combat on a barren planet. Can you win as defender of Earth?
$\$ 14.95$ (032)(041)
Zorx Wars ( 16 K or $\mathbf{6 4 K}$ ) Your starship battles Zorxian fighters, space cruisers, killer satellites and neutron bombs amid the black holes. All ages. $\quad \$ 12.95+\$ 2 \mathrm{p} \& \mathrm{~h}$ (001)
ZX Froggie ( $\mathbf{1 6 K}$ ) Guide your frog through hazards. Four levels of play. Fast action.
\$14.95 (041)
ZX Galaxia (16K) Formations of hostile Galaxians attack your ship in deep space. You must protect the Earth with your laser gun.
$\$ 14.95(037)(041)$
ZX Scramble ( 16 K ) Pilot your craft through the space maze. Evade and fire missiles. All machine code.
$\$ 14.95(032)(041)$

## Adventure Games

Adventure $1(\mathbf{1 6 K}) \quad$ Explore the caves. Find the treasure. $\$ 13.50$ (040)
"477 Adventure ( $\mathbf{1 6 K}$ ) price on request ( 040 )
Adventure To Korvas ( $\mathbf{1 6 K}$ ) Role-playing game. Map display shows progress as you seek a rare artifact.
$\$ 14.95$ (037)
Alien (16K) Based on the film. You have your choice of weapons as you stalk your quarry around the ship.
$\$ 14.95$ (111)
Alien Intruder/Hieroglyphics
( $\mathbf{1 6 K}$ ) Escape the deserted alien spaceship. Decode the 39 -symbol alphabet to make your getaway.
$\$ 10.60$ (040)
Alien Space Ship ( 16 K ) Escape aliens in search of humanoid slaves with your pet android, Fred.
$\$ 14.95(032)(041)$
Antropuss (16K) Travel through the cave, avoiding malicious bats and the man-eating Antropuss. You have only five arrows for self-defence.
$\$ 9.95$ (042)
Around Europe In 60 Hours (16K) Collect souvenirs on your whirlwind tour of Europe to win a wager.
$\$ 11.95(032)(041)$
Artillery ( $\mathbf{1 6 K}$ ) Given the target range, the user enters initial velocity and angle of elevation. Graphic display, four levels, scoring.
$\$ 9.95$ (042)
Aztec Gold (16K) Encounter mummies and other weird things in the temple of Tikhun in your search for gold.
$\$ 12.95$ (037)
Catacombs ( 16 K ) Find the gold before time runs out for you. Unlimited levels. $\$ 15.90$ (040)
Deathship Sabotage (16K) Stop the deathship before it gets to Earth.
$\$ 12.95$ (037)
Dragon Lair ( $\mathbf{1 6 K}$ ) A strategy-fantasy game. Magic, Wizards, theives, spells, monsters and dragons. Variable difficulty level. Includes guide booklet.
$\$ 15.95$ (087)

Dry Gulch (16K) Explore an old west ghost town in search of treasure. Vocabulary is over 100 words. SAVEable in progress.
$\$ 9.95$ (115)
Encounter (16K) Match wits with powerful alien intelligences. Can you prove your sentience?
$\$ 14.95(032)(041)$
Escape From Shazzar! ( $\mathbf{1 6 K}$ ) Your only escape is through the Temple. Avoid deadly hazards, collect keys and treasure. $\$ 12.95$ (074)
Escape From Stalag Luft III (16K) You are a P.O.W. Dig tunnels, make disguises, forge papers. Select your opponent character. Instruc tions and game card included. \$14.95 (079)
Espionage Island (16K) Crash land on an island in the South Seas. Avoid capture, respect the natives and find the secret.
$\$ 14.95$ (032)
Game Master ( $\mathbf{1 6 K}$ ) A control and recordkeeping system for fantasy adventure games. Records up to 12 characters and 6 monsters. Rolls dice. Compatible with "Dungeons and Dragons".
$\$ 14.95$ (060)
House Of Gnomes ( $\mathbf{1 6 K}$ ) Find the treasure and escape with it. $\$ 10.60$ (040)
Inca Curse ( $\mathbf{1 6 K}$ ) Adventures in an Inca temple in the South American jungles. $\$ 14.95(032)(041)$
Keltinor's Keep (16K) Search the castle for treasure. Combat hostile creatures. Keep has 20 rooms per level.
$\$ 7.95$ (058)
Keys To Gondrun ( 16 K ) Gondrun the wizard has lost his keys. Find them in caves of the enchanted forest. $\$ 9.95$ (032)
Merchant Of Venus (16K) You must be a skilliful trader and a skillful pilot in order to succeed.
$\$ 9.95$ (080)
Miner's Revenge ( $\mathbf{1 6 K}$ ) Graphics adventure puzzle. Find the motherlode in the maze of cavern tunnels.
$\$ 9.95$ postpaid (090)
Morloc Castle (16K) All machine code. Find and enter the secret castle. Defeat the wizard to gain the magic medallion and escape. About $20 \%$ words of vocabulary. SAVEable in progress. Difficult.
$\$ 14.95$ (115)
Nightmare Park ( $\mathbf{1 6 K}$ ) Use your wits to get through Nightmare Park. Features surprising twists.
$\$ 14.95$ (111)
Planet Of Fear ( 16 K ) Stranded on an alien planet, you must brave the perils to regain your ship and escape.
$\$ 14.95$ (032)(041)
Quest For The Staff Of Life ( 16 K ) Search over 80 rooms to regain the stolen staff. Large vocabulary.
$\$ 12.95$ (037)
Robbers Of The Lost Tomb ( $\mathbf{1 6 K}$ ) Recover four tablets hidden in a $100-$ room multi-level tomb. Age 15 and up.
$\$ 14.80(040)$
Space Defender ( 16 K ) A strategy game with graphic starmap. Defend your Space Station against enemy missiles. $\$ 14.95$ (111)
Space Ship ( 16 K ) You have been captured on an enemy slave mission. Gain the ship's control room for freedom.
$\$ 16.50$ (040)
Star Trek ( 16 K ) Clear the galaxy of the Klingon menace. Overcome the hazards of the galactic sectors.
$\$ 9.95$ (042)

Star Trek (16K) Command the Enterprise to destroy Klingons. $\$ 10$ (040)
Star Trekker ( $\mathbf{1 6 K}$ ) See what a good Trek can be. Based on the adventures of the popular series.
$\$ 14.95$ (111)
Starquest ( 16 K ) Run the gauntlet of galactic perils in a search for a New Earth paradise. $\quad \$ 14.95(032)(041)$
Subspace Striker (16K) Attack to disrupt

Federation supply lines. Be prepared to defend your ship. Graphics.
$\$ 14.95$ (041)
Supermonzxer ( 16 K ) Features multilevel caves, marauding monsters, giant bats, crooked arrows, bottomless pits, a magic sword and maneating spiders. All ages.
$\$ 6.95$ (004)
The Damsel And The Beast (16K) Seek the damsel in the palace. Kill the beast. Three skill levels.
$\$ 13$ (040)
The Wild West Adventure ( $\mathbf{1 6 K}$ ) Travel through the harsh terrain of the Wild West. Use your head and become rich.
$\$ 14.95+\$ 1.50$ s\&h (113)
The World Of Sangrel (16K) Search a world for a rare element. Split screen progress display. $\quad \$ 12.95$ (037)
Trader ( $\mathbf{1 6 K}$ ) A 48 K program in 3 units. Variables passed for continuity. Animated illustrations.
$\$ 19.95$ (041)
Trader Jack ( 16 K ) $\quad \$ 14.95$ (076)
Trident ( 16 K ) Many hidden dangers and concealed aids. $\$ 9.95$ (080)
Vault Of The Centaurs (16K) 14.95 (062)
Volcanic Dungeon/Hangman Rescue the Elfin princess. Defeat monsters. One or two players. 400 word vocabulary. $\$ 10.60(040)$
Z.S.S. Sinclair . . . Coldshutdown Graphics and text. The specimens of the Zoological Survey Ship Sinclair are loose. Repair the ship and fight off the creatures before coldshutdown. $\$ 12.95$ (091)

## Ball Games

Breakout (2K) The ball and paddle


Bust Out/Loco ( $\mathbf{1 6 K}$ ) For one or two players. All machine code. Two versions of the popular Breakout game. Loco is more difficult. High scores and high sets recorded.
\$14.95 + \$1 s\&h (114)
Mazeball (16K) Obstacle bouncing ball game. Seven mazes, high score. All machine code for speed. All ages.
$\$ 12.95(010)$
Trap ( 16 K ) Catch the bouncing balls. Pro-
gressively difficult and fast. $\$ 9.95$ (080)

## Board Games

Backgammon And Dice (16K) Easy to learn, last and exciting. Chance and skill. All machine code. Graphics of rolling dice and doubling cube. $\$ 14.95$ (080)
Battleship (16K) Two players, or you and the computer.
$\$ 7.95$ (009)
Battleship (16K) Keep your forces hidden while you try to sink the enemies'. $\quad \$ 9.95$ (032)(041)
Battleship (16K) Play against the computer. Destroy its fleet.
$\$ 10.60(040)$
Chess And Chess Clock ( 16 K ) Six levels of play. In machine code. All the legal moves. Graphic display. Separate records of plays for easy reference. Switch sides in mid-game. $\quad \$ 14.95 p(080)$

Chess I (Enhanced) (16K) Full display of chess board. Six levels of play - two with competitive time limits. For the advanced player. All machine code. Printer optional. $\quad \$ 14.95$ (032)
Chess $1.4(16 \mathrm{~K})$ Ten skill levels. Graphic display. Can change sides during the game. $\quad \$ 11.90$ (040)
Chess II (Master) ( $\mathbf{1 6 K}$ ) The most powerful chess game available tor the T/S 1000.7 levels of play, four in competitive time limits. Includes book ot 32 openings.
$\$ 24.95$ (032)(041)
Chesslab 5.0 ( 16 K or 64 K ) Analyses variations or adjourned positions. Aids but does not play. $90 \%$ machine code program. Includes user manual. All ages.
$\$ 19.95+\$ 2$ p\&h (001)
Domino (16K) Play against the computer. $\$ 9.95$ (042)

## Monopoly (16K)

$\$ 14.95$ (076)
Nerd! ( $\mathbf{1 6 K}$ or $\mathbf{6 4 K}$ ) Play against the computer in this simple board game. All ages.
$\$ 13.13+\$ 2$ p\&h (001)
1 K Chess ( 1 K ) Dne level. White queen or white king pawn openings.
$\$ 9.95$ (041)
Reversi (16K, N/A USA) Based on a minamax tree search with instant machine coded response.
$\$ 11.90$ (040)
Timeware Chess ( 16 K ) Try to beat your computer. Won the chess competition at the Consumer Computer Show in London.
$\$ 14.95$ (074)
2 K Chess ( 2 K ) Good graphics and a superior range of moves lor the unexpanded T/S 1000 . $\$ 14.95$ (032)(041)

## Card Games

Bridge (16K). Improve your playing and bidding. Adjustable skill level. One to four players. Challenge the computer.
$\$ 14.95$ (041)
Card Cut ( 1 K )
$\$ 1$ listing (040)
Crazy 8 A Poker 4 (16K) Graphic card display. Score-keeping. Peek at computer's Crazy 8 hand. Play 4 card Poker against the computer.
$\$ 10$ (057)
Flring Line ( 16 K ) Graphic solitaire. Displays four cards at a time. Continues until all 52 cards have been displayed. Computer monitors lor winning. $\$ 14.95+\$ 1$ s $\& \mathrm{~h}$ (114) Jeopardy ( 16 K ) Choose your score, then get it by matching pars ot cards out of 45. $\$ 11.70$ (040) Matrlmony/Noah's Ark (16K) Graphic solitaire games. Matrimony displays all cards tace up. Noan's Ark displays only the bottom row face up - more difticult. Both monitored tor winning.
$\$ 14.95+\$ 1$ s\&h (114)
Reddog ( $\mathbf{1 6 K}$ ) Bet on beating the top card. Win money from the pot. Beat the computer. $\$ 9.95$ (047) Strip Poker (16K) The computer deals the cards, takes the bets and announces the winner for two or more players. Instructions included.
$\$ 9.95$ cassette (030)

## Games of Chance

A Night In Las Vegas (1K) Roulette, Blackjack, Craps and Slot machine. Manual, guide cards, color layouts, chips and three color keyboard overlays included
$\$ 9.95$ (079)
Blackjack ( $\mathbf{1 6 K}$ ) As played in Nevada casinos. Up to five players against a dealer. Split pairs. DouTSU SHOPPERS' GUIDE
ble down. Insurance. Allows continuous game. $\$ 9.95$ (032) Blackjack (16K) Up to 6 players. Simultaneous display of all hands. Las Vegas rules. Split pairs, double down and insurance. $\$ 9.95(039)$ Blackjack ( $\mathbf{1 6 K}$ ) Graphic Display. $\$ 9.95$ (042) Blackjack ( 16 K ) Continuous play. Nevadastyle. Hit, stand, double-down, split and take insurance. Running score.
$\$ 10$ (064)

## Casino Pak I: One-Armed Bandit/Black-

 jack ( 16 K )\$14.95 (074)
Craps ( 16 K ) Computer rolls and
scores.
$\$ 9.95$ (042)
Dog Races (1 K) Watch the dogs chase the rabbit and guess the winner. $\quad \$ 2.80$ listing (040)
Gambler One ( $\mathbf{1 6 K}$ ) Bandit (slot machine) and Roulette.
$\$ 9.95$ (083)
Handicapper ( 16 K , printer optional) Enter statistics on each horse in the field. Computer calculates percent chance to win. Weighted point system.
$\$ 9.95+\$ 1$ s\&h (053)
Horse Master ( $\mathbf{1 6 K}$ ) Analyses data trom the Racing Forms. $\$ 7.95$ (009) Horse Race (1K) A tive-horse race that can be $\quad \$ 1$ listing (040) d
expanded. No ties. Horse Race Handicapping System ( 4 K ) A scientifically derived system that works. Ten factors trom the Daily Racing Form considered for each horse. Display of odds.
$\$ 24.95$ (094)
Jackpot Casino (16K) Tour the casino with your winnings and try your luck at Roulette, Craps. Blackjack, Slots, Racing, 5-Card Draw and AceyDucey. All ages. $\$ 6.95$ (004)
Jeopardy/Vegas (16K) Cards, roulette, and
slots.
$\$ 17.20(040)$
Kasino Kraps ( $\mathbf{1 6 K}$ ) Just like the real thing. Dice visible at all times. Multiple bets possible.


Play Bingo ( 16 K ) Ransom number plus letter combinations generated. All previously called combinations displayed. $\$ 4$ listing with S.A.S.E. (035) Roulette (16K) X| $\$ 9.95$ (042) Roulette Wheel ( 1 K ) Gives Las Vegas wheel irequencies for red and blask. \$1 listing (040). Slots $(16 \mathrm{~K})$ Six sets or graphics. Lets user
choose 5 C to $\$ 1$ machine choose 5c to $\$ 1$ machine. $\quad \$ 9.95$ (032)
Slot Machine ( $\mathbf{1 6 K}$ ) Six tigures appear at random in three windows.
$\$ 9.95$ (042)
Slot Machine ( 16 K ) Las Vegas-style wagering. Realistic payoffs. Animated graphic display.
$\$ 9.95+\$ 1$ s $\&$ (09 $\$ 9.95+\$ 1$ s $\& \mathrm{~h}$ (098)
The Die Is Cast ( 1 K ) Graphic dice roll.
$\$ 1.30$ listing (040)
The Gambler ( 16 K ) Blackjack and slot machine. Full graphics. $\$ 14.95$ (080)
Thoroughbred Handicapping
(16K) Generate a class rating and (16K) Generate a class rating and speed rating tor each horse. Employs statistical method. Includes instruction pamphlet. $\$ 12.50$ (022)
2 K Jackpot (2K) Six games ot skill and chance including Roulette, Craps. Slots, Blackjack, Horse race and Acey-Ducey.
$\$ 6.95$ (004)
Vegas (16K) Play roulette and the slot machine
to win. to win.
$\$ 11.70$ (040)


For more information, circle 36 on reoder service cord.


Yahtzee ( 16 K ) For one to four players. $\$ 9.95$ (042)
Yahtzee ( 16 K ) Computer rolls 5 dice. Played like poker. 13 categorles. Keeps score.
$\$ 14.95$ (041)

## Games Packages



Classic Games (16K) Lunar Lander, Dogfight, Mindmaster and Lite.
$\$ 9.95$ (079)
5-2K Games ( 2 K ) Spider Sam, Artist, Labyrinth, Mine Field, and Galactic Scout. $\$ 12$ (040)
Fun And Games Package (16K) Three games: Lunar Lander, Secret Code and Draw. listing (1K) \$2, tape (16K) \$9.95 (029)
Game Tape ( $\mathbf{1 6 K}$ ) Checkers: computer records, two users play. Six Dice accomades any number of players. Also includes a fast Big Letters routine.
$\$ 5.95$ post-paid (072)
Games Pack ( 16 K ) Action games. Two tor 1 K , five for 16 K .
$\$ 10.40$ (040)
Games Three ( 2 K ) Depth Charge, Bowling, Bingo and Tic-Tac-Toe. $\$ 9.95$ (083)
Games Two (2K) Darts for two players and Mastermind.
$\$ 4.95$ (083)
Grab Bag II ( 1 K ) Calculator seem-to-memory, counter systems.
$\$ 1$ listing (040)
Gunfighter/Tic-Tac-Toe/Life ( 16 K ) A graphic wild west shootout. One or two players. Six levels. A challenging version of the popular game, and a simulation of cell colony growth based on user-entered data.
$\$ 11.95$ (032)
1 K Games Pack ( 1 K ) Eleven games for the unexpanded T/S1000. Maze, casino and action games.
$\$ 9.95$ (032)(041)
Program Pack I (1 K) 6 games - Digiclock, 9 -Lives, Reaction Test, Dice, Gobbler, and Patterns. $\$ 21.40$ (040)
Program Pack 2 (16K) Pontoon, Fruit Machine, X's and 0's, and Bio-rhythms. \$16 (040)
Program Pack 3 ( 16 K ) All machine code. Astropilot, Graphic Designer and Roadrace. $\quad \$ 21.46$ (040)
Program Pack 4 ( 16 K ) All machine code. Includes Asteroid and Surround. \$16 (040)
Program Pack 5(16K) Includes Traps, Sheep, Reaction Timer and Trails.
$\$ 16$ (040)
Program Pack 6 (16K) 3-D X's and 0 's in machine code and Mars Rescue. $\quad \$ 21.30$ (040)
Program Pack 7 (16K) Zombies and Mount Mahem.
$\$ 16$ (040)
Program Pack 8 ( 16 K ) Word Search, Towers of Hanoi, Germ Warfare and Intercept. \$16 (040)
Return From Space/Missile Launcher (16K) $\$ 17.20$ (040)
$\mathbf{1 6 K}$ Games Pack ( $\mathbf{1 6 K}$ ) Four challenging games. Tic-Tac-Toe, logic and 2 action games.
10 Great Games ( 16 K ) $\quad \$ \quad \$ 14.95(076)$
The Challenger 1 ( 2 K ) Contains Amazer, a) maze-chase game with 10 difficulty levels. and Tiof Jac-Toe.
The Mixed Game Bag I(16K) Contains Bowling, Robot War and Bingo Caller. All feature graphic displays.
$\$ 9.95$ (080)

Mixed Game Bag II (2K) Mindgame package includes Memory Magic, Concentration and Supermind (decipher the graphics, five levels of play).
$\$ 9.95$ (080)
The Mixed Game Bag III ( 2 K ) In Blitz, bomb the targets. 256 speeds. In Rats Nest you trap your opponent. 256 speeds of play. The Snake collects the money its pit. Sketch Pad lets you draw on the screen. Cross The Road resembles a part of the Frogger arcade game.
$\$ 9.95$ (080)
2K Six Pack ( 2 K ) Entertaining and instrucional. Word Juggler, Electro-Sketch, Space Dodger. Scrambler, Guessing Game and Spiral Spots.
$\$ 9.95$ (087)
Zombies And Sword Of Peace (16K) Defeat the zombies by luring them into potholes. Free yourself from a dungeon to become Monarch of $0 z$.
$\$ 14.95$ (032)

## Maze Games



Centepede ( 16 K, graphics board) Shoot it in the middle or you have two to fight. $\$ 10.30$ ( 040 )
Centepede ( $\mathbf{1 6 K}$, graphics board) High scorIng game. If you can't destroy one, it becomes two.
$\$ 11.80$ (040)
Chewter ( 1 K ) Like Pac Man.
$\$ 2.80$ listing (040)
Crazey Mazey (2K) Four maze games: Byte Bite, Slalom, Labyrinth and Cat and Mouse. Age 8 and up.
$\$ 14.95$ (096)
Dragon Hunt ( $\mathbf{1 6 K}$ ) Find and slay three dragons in their caves. Find the magic sword, evade giant bats and the ghastly monster. $\$ 12.50(109)$

 Ghost Hunt ( 16 K ) Chomp through the maze. Get the ghosts.
$\$ 11.70$ (040)
Gobbleman ( 16 K ) Run around the maze chased by ghosts. Personalized "high score" feature. All in machine code for speed. $\quad \$ 14.95$ (032)
Grimm's Fairy Trails ( 16 K ) A young prince is trapped in a maze, chased by the maze-dwellers. Can you gain the life crystals and sacred stones? Six levels of play.
$\$ 14.95$ (080)
Marbles, Mazes And Sink Holes (16K) Sixty mazes of varying skill level. $100 \%$ machine code. Race against time. All ages.
$\$ 12$ (024)
Maze (16K) A series of progressively ditficult invisible mazes. Solve each one before the air runs out. You have only three magic weapons and your wits. $\quad \$ 11.95 \& \$ 1.50$ s\&h (106)
Maze Drag Race ( $\mathbf{1 6 K}$ ) Maze is 9 times screen size. Avoid the obstacles. Several skill levels. $\quad \$ 11.70$ (040)
Mazeman ( $\mathbf{1 6 K}$ ) (N/A USA) Machine code. Like Pac Man.
$\$ 11.90$ (040)
Mazogs (16K) Find the treasure. Battle Mazogs. Detailed graphics. New maze every game. $\$ 20$ (040) Mr. Munchee ( 16 K ) Munch away and avoid the trolls. Three mazes and variable speeds. $\$ 14.95$ (041)
Pac Man ( 16 KK ) Like the original. Full screen.
Pac Man (16K) Like the original. Full screen.
Instructions. Easy controls. $\quad \$ 21.30$ (040)

Pack 'Em In Monzxer (16K) Chomp through the maze avoiding goblins. Several levels. All ages. $\$ 6.95$ (004)
Pakguy (16K) All machine code. Three fullscreen mazes. Variable speed and skill levels.
$\$ 6.95$ (058)
Peckman ( 16 K , Kayde graphics board) Like Pac Man. $\quad \$ 11.70$ (040) Puckman (16K) All machine
code. code. $\$ 11.80$ (040) $\$ 14.95$ (111)
Speed Snake ( $\mathbf{1 6 K}$ ) Ten mazes. Snake eats nuts and grows. Fast and skill-challenging. $\quad \$ 14.95$ (041)
Supermaze ( 16 K ) A 3-D maze complete with trap doors, gold bars, marker stones and a compass. Ten mazes, up to four options each.
$\$ 14.95$ (080)
3D Monster Maze (16K) You are in this 3-D maze. The Tyrannosaurus Rex is after you. $\quad \$ 15.90$ (040)
Tunnels ( 16 K ) For two players. One is the Evil Mayor, creating mazes. The other is the local good guy, in the maze. Age 8 and up. $\$ 7.95 \& \sin (025)$

## Mind/Word/Puzzle Games

Alphabet Soup and Numbers Up ( 16 K ) The object is to arrange the pieces correctly. Can be saved at any point. All ages.
$\$ 14.95$ \& \$1 s\& (114)
Challenge I ( 16 K or $\mathbf{6 4 K}$ ) Two games: "Code Cracker" and "Tic-Tac-Toe". Variable skill levels. All ages. $\quad \$ 12.95 \& \$ 2$ p\&h (001)
Computer Match (16K) Like the game of Concentration. Find your match on the screen.
$\$ 7.95$ (009)
Concentration/Word Challenge/Number Challenge (16K) match numbers, shapes or patterns against a player or the computer. Find the words with up to six players. Test your memory against the computer with up to six players.
$\$ 14.95$ (032)
Crypto $(16 \mathrm{~K})$ Challenging cryptograms of detinitions or quotations for you to solve. Enter your, Own acwell $\$ 14.95$ (041)


Hangman ( 16 K ) Two games - one with over 100 movie stars and titles, the other with superheroes and their archenemies. $\$ 9.95$ (032)
Hangman (16K) Seven categories, create your own dictionary of up to 400 words. Program includes starting dictionary in 7 areas. $\quad \$ 10$ (057)
Island Squares (2K) $\quad \$ 1.90$ listing (040) Letter Logic $(1 \mathrm{~K}, 2 \mathrm{~K}$ or 16 K specify) Version ol a popular game. Improve your logical thinking. Indicates "right on" and "almost" $\quad \$ 7.95$ ( 1 K or 2 K ) $\$ 11.95(16 \mathrm{~K})$
plus $\$ 1.50$ s \&h (113)

## Mega Mind (16K) <br> $\$ 14.95$ (062)

Mine Field ( $\mathbf{1 6 K}$ ) Ten levels ol difticulty. Navigate the mine tield alter one look at the map. $\$ 9.95$ (083)
Murder In The Ram (16K) Race aganst the computer and up to 5 other players to solve the "who-dunnit". Clues given by the computer. $\$ 6.95$ (004)

Number Squares ( $\mathbf{1 6 K}$ ) Graphic brain teaser Arrange the 81 pieces according to the rules. Can be saved and re-started. For all ages. $\$ 14.95$ \& $\$ 1$ s\&h(114)
Quiz Kit (16K) Create a quiz of 23 questions with multiple-choice answers
$\$ 16.90$ (040)
Rubik's Master (16K, printer optional) Scrambles and solves the infamous cube step-by-slep. Displays each move in 3-D graphics and simple notation system.
\$15 (Computer Engineering Services)
Semaphore (2K) A "Rubik's Cube" simplilied for younger children. $\$ 1$ listıng (040)
Serious Cryptology ( 1 K ) Find the key and decode the messages. $\$ 3.80$ listing ( 040 )
Shell Game/Number Maze ( 16 K ) Keep track ol the hidden "pea'". Move the numbers into patterns within the square.
$\$ 9.95$ (032)(041)

## (4) Whanw


Spinner ( 16 K ) Like Rubik's cube.
2
$\$ 1.90$ listing (040)
The Cube Game (16K) Three views, solid. unfolded, and 3 -dimensional (see-1hrough). Start with the cube solved or pick up from a previous session.
$\$ 12.95$ (080)
The Nowotnik Puzzle (16K) The computer scrambles the pattern. You try to return it to its original condition. $\$ 14.95$ (074)
The Puzzler ( 16 K ) "Inversion" lakes a minimum of 250 moves to solve. "Double Inversion" is twice as difficult. SAVEable in progress.
$\$ 12.95$ (080)
Tic-Tac-Toe (16K) Good graphics
$\$ 2$ listing (116)
Towers Of Hanoi A problem as old as the pyramids. How many moves will it take you? $\quad \$ 14.95$ (111)
Top Secret ( $\mathbf{1 6 K}$, printer optional) You can encode and double-encode messages. Over 65,000 possibilities. Also decodes. Printer option.
$\$ 13.40$ (040)

## Party-Novelty Games (Entertainment)

Biomate (16K, printer optional) Three programs. Performs compatibility analyses. Plo1s Biorhythms. Conducts match-making searches. Also incorporates data base management system. $\$ 15.95$ (087)
Biorhythms (16K) Track your cycles for intellectual, physical and emotional taciors. Find your
phase for the day. Includes booklet on theory and application.
$\$ 11.95$ (032)
Biorhythms ( $\mathbf{1 K}$ ) Results for any date.
\$1 listing (040)
Christmas Party Package (16K) Three programs. Scrolls "Merry Christmas" across the screen. Plays "Jingle Bells" through a nearby radio. Draws aulomatically.
\$3 listing, \$10.95 tape (029)
Constellation (16K) Displays night skips of this century. Move telescope anywhere on Earth. Stars displayed by constellation or magnitude.
$\$ 15.80$ (040)
Does Nothing Program (1K) Grunts and groans figuratively, bu1 does nothing. $\$ 1$ (040)
Dr. Floyd (16K) Carries on a conversation with you using psychoanalytic techniques. Resembles artificial intelligence. Age 10 and up. $\$ 10$ (101)
6X Sideways Billboard ( $\mathbf{1 6 K}$ ) Scroll $300^{3}$ characters right to left. $\$ 1.80$ listing
4X Sideways Billboard (16K) Scroll $1000^{3}$ characters right to left.
$\$ 1.80$ listing (040)
Madame Ruby Package (16K) Artiticial intelligence program responds to your questions with unique or standard answers.
$\$ 2.50$ listing \$12-0500entle (029)
Magic Cube Generator ( 16 K ) Generates four by four by four magic cubes. $\$ 1.90$ listing (040)
Magic Square Generator ( $\mathbf{1 6 K}$ ) Generates 384 four-by-four magic squares. $\$ 1$ listing (040)

Moving Billboard (1K) Double-spaced message lines move up the screen and repeat. \$1 listing (040)
News Bulletin Board (1K) Scroll your message (up to 250 characters) across the screen.
$\$ 1.80$ listing (040)
Personal Bio-Rhythms (16K, printer optional, specify make) Find your peak and critical days. Complete one-month cycle of physical, emotional and intelleciual patterns.
$\$ 9.95$ (039)
Program Of Days (16K) An his1orical databank. Noteworthy events accessed by date.
\$11.95 (032)
Random Music ( 1 K ) Plays random musia through your television's speaker. $\$ 1.80$. Iis $1 \mathrm{ing}(040)$
Solar System File (16K) Finger-1ip access 10 amazing facts about celestial objects and relationships.
$\$ 11.95$ (032)
Spiral Of Archimedes (1K) \$1 listing (040)
Sunrise/Sunset Complete months or years of tables for sunrise and sunset times of every 3 days for any location and time zone entered. $\$ 9.95$ (039)

Tarot ( $\mathbf{1 6 K}$ ) Le1 the cards predic1 your future. Full 78 -card Tarot deck. Full graphic representation of the 22 major Arcana cards. Computer reads and explains each card in your tortune, or describes and defines each card of the deck.
$\$ 9.95$ (080)
The Fantastic Music Machine And Light Show ( 2 K ) Two programs - turn your computer into a 3-octave musical instrument. Stores, edits and plays back 400 notes in $2 \mathrm{~K}, 7000$ in 16 K . Light show races a kaleidoscopic pattern around the screen.
$\$ 9.95$ (079)
The Ultimate Forecast (16K, printer optional) The computer shuffles and deals the Tarot Cards. Position and significance of each card is given. User interprets.
$\$ 4.95$ listing. $\$ .95$ cassette, pos1paid (027) Tower Billboard $(16 \mathrm{~K}) 8 \mathrm{X}$ vertical scrohl Virtuoso (2K) Synthesizes music. Ten octave range, 150 note length, whole to 32 nd dotted notes

\& rests. Self performs songs at any tempo. Uses TV or radio speakers.
$\$ 6.95$ U.S. \& Can., $\$ 9.95$ elsewhere (054)
Your Key Colors Using Numerology (16K) (Printer Optional) Study your character using color and numerology.
$\$ 9.95$ (039)

## Simulation Games

Airline (16K) You are the new chairman and have 7 years to increase your funds by a factor of 10 and take over the competition. $\$ 16$ (040)

Copy Shop (16K) Open a new business
$\$ 16$ (040)
Dictator ( $\mathbf{1 6 K}$ ) Maximum your profits withoul getting overthrown or killed. $\$ 18$ (040)
Inheritance ( $\mathbf{1 6 K}$ ) Prove your financial acumen in order 10 inherit a fortune. Two challenges 10 meet.
$\$ 11.95$ (032)(041)
Monarch! (16K) Control your kingdom. Make wise decisions for your people. $\$ 12.95$ (074)

Pop Star ( 16 K ) Question and answer forma1. Make il big or go broke. $\$ 9.95$ (032)
Presidential Campaign (16K) Manage your campaign well and get elected. One to four players.
$\$ 16.90$ (040)
Restaurant (16K) Open a new restaurant. $\$ 16(040)$
Run The Country (16K) Can you successiully tinker with the budgel and policies - and still get elected?
\$11.95 (032)(041)
Stock Market Game (16K) Play the market. Win if you accumulate $\$ 50,000$. $\$ 12.95$ (080)
Wall Street ( $\mathbf{1 6 K}$ ) One to four players invest in the market. Computer advises. $\quad \$ 16.90$ (040)
You're The Boss ( 16 K ) Guide your business to success or bankruptcy. For one or two players.
$\$ 10.95$ \& $\$ 1.50$ s\&h (018)

## Sports

16 Hole Golf ( $\mathbf{1 6 K}$ ) Up to five players. Graphic display of each hole. Three different 18 -hole courses. Display gives hole number, par, current shot, current score \& name of player. $\$ 10.00$ (057)
Football ( $\mathbf{1 6 K}$ ) Uses statistics to plan strategies and calculate gains. Tactics available to both user \& computer. Stationary graphics. All ages. $\quad \$ 6.95$ (004)
Football (16K) College football for 1 or 2 players. Seven offensive plays, computer detence. $\$ 9.95$ (083)

Minigolf (16K) Eighteen holes. Nine levels of difficulty. Variable hazards. Animated ball. Option to play same or new random course. $\$ 6.00$ (057)
Golf Handicapper (16K) (Printer Optional) Handicaps computed in accordance with guidelines established by the USGA for 18 -hole courses. Menu-driven, seven options.
$\$ 20.00$ (011)

NFLX Football (16K) All machine code, for one or two players. All moves graphically enacted. Six offensive and four detensive options.
$\$ 9.95$ (090)
Pro Football Forecase (16K) Considers coaching, weather, injuries and 13 other factors for each team. Gives winner and expected point spread.
$\$ 4.95$ listing, $\$ 9.95$ tape - postpaid. (027)
Strategy Football (18K) Five offensive and four defensive plays offered. Realistic options.
$\$ 9.95$ (080)
ZX Open ( 18 K ) Simulates golt on a 5240 yd . par 71, 18 hole course. Select club \& hook slice or miss the ball. Realistic hazards. Automatic scoring. Ages 15 \& up.
$\$ 16.95$ (017)

## Books

Basic Basics for the Timex Sinclair 1500 by M.P. and S.J. Barnette. Introduce your family to BASIC. Many useful applications for the home.
$\$ 9.95$ (074)
Basics Of Timex Sinclair 1500 Basic by A. Wolach. Introduction to programming in BASIC. Step-by-step, with examples.
$\$ 9.95$ (074)
Byteing Deeper Into Your ZX81 by Mark Harrison. Price on request. (040) Computers For Kids Sinclair Edition by S . Larsen.
$\$ 6$ (040)
Converting To Timex/Sinclair Basic: A Guide To Translating Basic Programs by S.L. Bird. Translate programs written in other BASICs to run on the T/S1000. Ditterences and examples given. Over 130 BASIC instructions discussed. $\$ 14.95$ (034)
Explorer's Guide To The Timex Sinclair 1500 by M. Lord. Discover new features and techniques. Learn machine code programming and elements of RAM. Thirty programs. Hardware tips.
$\$ 9.95$ (074)


12
$501 \mathrm{~K} / 2 \mathrm{~K}$ Games For The Timex Sinclair 1000 by Gourlay, Walsh and Barnett. Pick up programming tips and techniques.
$\$ 13(040)$ $\$ 9.95$ (074)
Fifty Programs For The Timex Sinclair 1000 (Unexpanded) by L. Carter. Fifty ready-to-run listings for beginners and experienced. Games, puzzles, calculatıons, filing, graphics, calendars and others.
$\$ 6.95+\$ 2$ s\&h (107)
49 Explosive Games For The ZX81 by T. Hartnell.
$\$ 11.90$ (040) $\$ 9.95$ (074)
Getting Acquainted With Your ZX81 $\$ 11.70(040)$
Graphics, A-Z How to program hi-tech graphics. Special section on the Memopak HRG module. Easy to understand machine code section. $\$ 19.95(008)$
Hints And Tips For ZX81 Price on request
(040)

How To Use The Timex Sinclair Computer by J. Willis $\$ 4.80$ (040)
Learning Timex Sinclair Basic by D.A. Lien. Full length step-by-step instruction tor the beginner.

352
pages
Paperback. $\$ 14.95$ (016)(032)
Machine Code And Better Basic by 1. Stewart and R. Jones. Introduces structured BASIC programming and machine code. $\$ 11.95$ (103)
Machine Language Programming Made Simple For Your Sinclair \& Timex TS1000. by Melbourne House. $\$ 15.90$ (040)
Making The Most Of Your ZX81 by T. Hartnell. Sixty exciting programs. Debugging, tricks, commands and statements.
$\$ 13$ (040)
$\$ 9.95$ (074)
Mastering Machine Code On Your ZX81 by T. Baker. Comprehensive guidebook. Many programs and examples. "All the programming techniques you'll need."
$\$ 12.70(040)$
$\$ 9.95$ (074)
More Uses For Your Timex/Sinclair 1000: Astronomy On Your Computer by E \& H.J. Burgess. Ready-to-run programs. Observe the sky on your monitor screen. $\quad \$ 8.95$ (088)
Music/Sounds Package Requires 2K. How to broadcast music and sounds to a nearby radio with no additional equipment. Five listings included control the radio frequency interference. $\$ 2.50$ (029)
Not Only 30 Programs Programs illustrate the capabilities of the unexpanded T/S1000,2×8t. Programming hints and explanations throughout. $\$ 9.95$ (032)
$\$ 10.30(040)$
Peek Poke Byte \& Ram ZX81 Price on request.
(040)

Pocket Book Price on request.
(040)

Programming Your Timex Sinclair 1000 In Basic by M. Eisenbacher $\$ 11.20$ (040)
Sinclair ZX81 Prog/Ri Applications Price on request.
(040)

Sinclair ZX81/Timex Sinclair 1000 Statistics Twelve 16 K programs. 200 pages. $\$ 11$ Same programs on 6 cassettes $\$ 15$ (043)
Stretching Your ZX81 To Its Limit Price on request.
(040)

TS Microdrive Technical Brochure Discusses the uses, requirements and capabilities of disk and high speed tape drive systems for the T/S1000,2X81. Describes the T/S Microdrive. $\$ 3$ postpaid (008)
T/S1000 Programs, Games And Graphics by Jones and Stewart. \$11.90(040)

T/S1000 Users Guide by Or. Girratano. Step-by-step introduction to programming in BASIC.
$\$ 11.90$ (Vol.1) (040)
$\$ 9.95$ (Vol.1) (067) St2.95 (Vol.2) (067)
TS2000 Technical Brochure Complete description drawn from dealer specificatıon sheets. \$3 postpaid (008)
The Basic Handbook, An Encyclopedia Of The Basic Computer Language by D.A. Lien Largest and most current collection ot BASIC terms available anywhere. Alphabetical listing, with test programs and sample runs. Variations in usage and alternate spellings. Tips on BASIC translation from other BASICs. 480 pages.
Paperback. Paperback. $\$ 19.95(016)(032)$ The Best Of Sync edited by $P$. Grosjean. $\quad \$ 11.70(040)$
The Complete ZX81/TS 1000 Basic Course by Melbourne House. Includes 2 tapes. \$31.90(040)
The Explorers Guide To The ZX81 And The Timex 1000 by M. Lord. $\$ 12.60$ (040)
The Gateway Guide To The ZX81 And ZX80 by M. Charlton $\$ 11.70$ (040)
The Timex/Sinclair Directory Where to find virtually everything tor the $T / S 1000,2 \times 81$. Photos, descriptions and supplier's addresses. 90 pages. Paperback.
$\$ 5.95$ postpaid (008)
The Timex Sinclair 1500 Pocket Book by T. Toms. Everything you need to know about your computer. BASIC, program listings, handy subroutines, examples and a complete guide to programming.
$\$ 9.95$ (074)
The Timex Sinclair 1000 Basic Handbook by D. Hergert. Clear examples of each word in the T/St000 BASIC vocaulary presented dictionary-style. Proper syntax caretully explained. Short sample programs demonstrate commands. Notes on subtleties and extra teatures. $\$ 7.95$ (088) The Timex/Sinclair User's Encyclopedia by G. Phillips and J.C. March. Cross-referenced alphabetical listing. Total guide to the T/S computers. Useful tool for the new owner. 350 pages. Paperback. $\$ 14.95$ (006)
30 Hour Basic ZX81 Edition Price on request.
(040)

30 Programs For The Timex PC1000 by Melbourne House.
$\$ 11.20$ (040)
34 A mazing Games Price on request. (040)
37 Programs For Timex 1000 Sinclair ZX81
$\$ 10.80$ (040)
Timelost For The Timex/Sinclair 1000 Comic book adventure instructs in programming. For the unexpanded T/S1000,2×81. \$6.95 (067)
Timex/Sinclair Basic Programs in Minutes by S.R. Trost. Take tull advantage of the T/S 1000 functions. Practical programs. $\quad \$ 7.95$ (088)
Timex/Sinclair 1000 Pocket Dictionary Lists words and concepts. Complete set of $Z 80$ machine commands. Tips on saving memory. Complete character set.
$\$ 4.95$ (067)
Timex Sinclair 1000: Programs, Games and Graphics by R.Jones and 1. Stewart. A guide tor beginners. Graphics programming, debugging techniques. Over 50 ready-to-run games.
$\$ 10.95$ ( 103 )
Understanding Your ZX81 ROM by lan Logan.
$\$ 15.90$ (040)
Using And Programming The Timex Sinclair 1000
$\$ 12.10$ (040)
Using The Timex/Sinclair 1000 by R.M.


Coletti. For those who nave mastered the owner's manual and wish to go on. Programming and hardware moditication suggested. Sample programs provided.
$\$ 9.97$ (034)
What Can I Do With 1 K ? Price on request.
(040)

Your Family, Basic And The Timex 1000 by M. and J. Barnett $\$ 14.76$ (040)
Your Timex Sinclair 1000 And ZX81 by 0. Hergert. A beginners' guide to the T/S1000 computer. ''How to' directions.
$\$ 6.95$ (088)
ZX81 Basic Book Replaces the T/S 1000, ZX81 user's manual. Much more in-depth and complete. Explains computer tunctions with illustrative examples. Very "user friendly" for beginners. $\quad \$ 12.95(008)$ $\$ 15.50(040)$
ZX81 Companion Price on request.
ZX81 ROM Disassembly Part A \& Part B by lan Logan.
$\$ 19.90$ (040)

## Hardware

## Graphics

Block Painter (1K) Paint on the screet horizontal or vertical lines one character wide. \$1.00 listing (040)
Block Pattern Generator ( $\mathbf{1 8 K}$ ) Generates 65535 designs based on $16-\mathrm{pt}$. array. $\$ 2.80$ listing (040)
Diagram Maker/Saver (2K) (Printer Optional) Prints any character, paints screen trom keyboard, has flashing eraser. Can be copied to printer and saved.
$\$ 11.80$ (040)
Draw And Recall ( 16 K ) Draw on the screen and store the result. Like "turtle" graphics. move without drawing, erase and delete also featured. Young programmers
$\$ 9.95$ lape $\$ 2.95$ listing (030)
8 K Rom Character Generator ( $\mathbf{1 K}$ ) Where it is and how it works. How to use it for 4 X or 8 X characters. $\quad \$ 2.80$ listing (040)
8X Characters ( $\mathbf{1 K}$ ) (Printer Optional) Up to 8 characters on the screen together. Printable. $\quad \$ 1.40(040)$

Ellipses And Circles ( $\mathbf{1 K}$ ) $\$ 1.40$ listing (040) Etch-A-Screen (2K) (Printer Optional) Oraws text and graphics in any direction. Any speed. Save or print. With 16 K of memory, store 20 video slides and display them in rotation with selected pauses. Also, CRAZY PRINTER - draws random pattern on the screen, wild and fast $\quad 50.95 .071$


## $7 \times$ Characters ( 1 K )

Graphics Billboard ( $\mathbf{1 K}$ ) Displays words or graphics.
$\$ 1.40$ listing (040)

Graphics Pac 1 (18K) An introduction to Sinclair graphics. Two random picture drawers, a screen formatter and a "Dooder".
$\$ 10.00$ (101)
Hexal Pattern Generator ( $\mathbf{1 8 K}$ ) Generate and display 65535 patterns based on 36 pt . array. $\quad \$ 3.80$ listing ( 040 )
IBAL ( 16 K ) Wire-frame modelling program. Store any object in memory and view it from any point. Expands image to maximum possible size on the screen. Easy to use.
$\$ 14.95+\$ 1.50 \mathrm{p} \& \mathrm{~h}(005)$

## Kayde 3D/3D (18K)

$\$ 11.80$ (040)
Metagraphics ( $\mathbf{1 8 K}$ ) Create elaborate drawings. Over 2000 ditterent graphics charcters and backgrounds. Unlimited artistic freedom. Especially for children.
$\$ 12.95$ (010)
Mysterious Matrix (16K) Plots a matrix of patterns defined by input. $\$ 2.80$ listing (040)
Olbique Painter ( $\mathbf{1 K}$ ) Sketches diagonal lines.
$\$ 1.00$ listing (040)
Plot Painter ( 1 K ) "Paint" in all directions on the screen. Erases, can make isoareal patterns. Has PIXEZ Counter. $\$ 1.40$ listing (040) Quilter ( $\mathbf{1 K}$ ) ( $\mathbf{1 6 K}$ ) Paint in one corner and they computer will duplicate in blocks like a quilt. $\$ 1.00$. Iisting (040) \&
Random Fences (16K) Plots random tences scrolling up the screen. $\quad \$ 1.80$ listing (040)
Screen Painter ( $\mathbf{1 K}$ ) Sketches horizontal and vertical lines.
$\$ 1.00$ listing (040)
The Great Communicator And Opmax (18K) Animated likeness of a familiar political figure. Try your hand at video ventriloquism. OpMAX creates moving "paintings" on your screen.
$19.25+5150554(605)$


Tower Billboavd $(1 \mathrm{~K})$ frints $\mathrm{SIX} 4 \times$ characters on the screen.
$\$ 1.00$ listing (040)
TS-Art (16K) (Printer Optional) Graphics program and LOGO-style educational tool. Indirectly teaches concepts of arithmetic, geometry and computer science. Eight directions. Selectable background. Detine new graphic commands. Expand, compress or rotate. Save or print.
$\$ 12.95(+\$ 1.50 \mathrm{~s} \& \mathrm{~h}$ in US, $\$ 2.50 \mathrm{~s} \& \mathrm{~h}$ abroad) (045)
DVC-2 Inverse Video Kit Small board fits inside computer case. Only 4 wires to connect. Provides a direct video output to drive a standard video monitor. Switch selectable normal or reverse video. $\$ 18.95+\$ 1.50$ p\& ( 071 )
Graphic Charts Plan your displays on these printed paper forms betore coding. Saves time. $81 / 2^{\prime \prime} \times 11^{\prime \prime}$. Grid, line and column numbers, $X, Y$ coordinate numbers.

Pack of $100 \$ 4.95$ (030)


Kayde Graphics Board Fits inside the computer with ribbon connector and 5 wires. 4 K EPROM gives 6 sets ot 450 characters plus their inverses. Spare slot for 4 K TOOLKIT ROM, 2 K RAM or 2 K User Definable Graphics. Located in $8-16 \mathrm{~K}$ block.
$\$ 40.00$ (040)
Kayde 2 K User Definable Grapics Chip plugs in the KAYDE GRAPHICS BOARD. Gives 256 user defined characters. Complete with software.
$\$ 21.30$ (040)
Memo-Rez 84 K Provides high resolution graphics. Compatible with plug-on peripherals. Switchable 8-16K region. $\$ 189.95$ (008)
Memopak Hrg. Resident 2K EPROM programmed with a full range of graphics subroutines enables display of high resolution "arcade game" style graphics. Fully programmable capabilities.
(055)

Video Inverter Small circuit requires four solders. Permits switch from black characters on white to white characters on black. Toggle switch. Versions for VHF and UHF output. Complete instructions. $\$ 16.95$ (008)
Zotex Light Pen (N/A USA) Oraw and save from the screen. $\quad \$ 131.50$ (Canadian) (040)

## Interfaces

AGF Stackable Joystick Interface II for one or two joysticks. Controls eight directions, including 45 degrees and fire. Comes with demo etch-a-screen cassette.
$\$ 36.00$ (040)
Basicare Persona Enables growth of an ORGANIC MICRO on the T/S1000. Buffers all signals trom the expansion port via ribbon cable. "Talks" to other modules via a 64 -way Organic Bus configured to fit into the given Address Map. $\quad \$ 59.95$ (032)
Byte-Back RS232 Interface Stackable. Baud rate adjustable. 75-9600.
$\$ 61.50$ (040)
I/O Expansion Board Permits I/O interfacing or the T/S computers. Similar to the standard micro computer S-100 bus. Allows simultaneous connection to a number of external devices. $\$ 89.95$ (032)
Memopak RS232 Interface Basic and Terminal Modes Communicate along industry standard lines with other computers and peripherals, including modems and printers.
$\$ 99.95$ (055)

## Keyboards \& Accessories

Chirper Sounds on key entry. Sound varies with function - can signal end of line. Sounds can be programmed. Included is a demo program that converts the keyboard into a music keyboard of two oclaves.
$\$ 9.95$ (003) (040)
DK'Tronics Full Size Keyboard Computer tits inside the case. Regular output bus and small motherboard for memory. 52 keys including the separate numeric, period, shitt and cursor pad.

Needs modification for VHF computers
$\$ 71.60$ (040)
Dean Case For Full-Size Keyboard Keyboard and computer fit inside. UHF computer requires modification.
$\$ 22.00$ (040)
Dean Full-Size Keyboard 47 keys. Full space bar. Six user-definable keys. Attaches with ribbon cable. No case.
$\$ 93.60$ (040)
EC-11 Enclosure For the E-Z Key 60 keyboard. Holds computer; access for RAM, TV, cassette recorder and power. Vented.
\$29.95 (108)
E-Z Key 60 Sixty moving keys. Plugs-in. Numeric keypad, auto-shift on eight keys, two shift keys, full space bar.
$\$ 89.95$ (108)
Gladstone Professional Keyboard \& Case A full-sized keyboard. 47 keys and full space bar. Plugs in by flexible connector. Longwearing.
$\$ 79.95$ (032)
I.D.S. 44-Key Rebuilt Keyboard Uses 8 inch ribbon cable. Keys include 2 shift, 2 \#1/EOIT and 2 unused. Letter keys only fully legended. $\$ 47.00$ (040)
I.D.S. On/Off Toggle Switch For "001 Chirper (Requires Chirper) Requires hole in csae and 2 soider connections.
$\$ 2.20$ (040)
I.D.S. Repeat Module Solders inside case with 9 wires. Converts all keys to autorepeat. may interfere with some games.
$\$ 18.40$ (040)
KD-81 Full size, 41 keys. Extra shift key. Case holds keyboard and computer. No soldering.
$\$ 59.95$ (086)
KP-1 Keyboard Plans Step-by-step plans for converting to a tull-size keyboard. Soldering skills required.
$\$ 7.50$ (068)
Kayde Full Size Keyboard Uses ribbon cable and 15 solder connections. 40 keys plus repeat key. $\$ 74.40$ (040)
Keyboard On/off switch, two shift keys, two ENTER keys, shift lock, full space bar, seven Single-stroke keywords, repeat key. Optional numeric keypad. Feedback problems eliminated.
$\$ 129.95$ (111)
Keyboard Bleeperf Installs inside the computer. Produces a destinctive BLEEP! when keys are pressed. Words on all keys but shift and in SLOW and FAST modes.
$\$ 25.00$ (015)
MK IV Keyboard \& Numeric Pad Uses same switches as OEC and Hewlett-Packard keyboards. 41 keys and full space bar. 19-key pad plugs into keyboard. Long-wearing.

Keyboard $\$ 89.95$
Keypad \$49.95 (008)
MK II Click Switch Overlay Fits over the original keyboard. Features depressable "click" keys. Promotes speed of data entry. Extra key available for conversion to special functions.
$\$ 79.95$ (008)
Memopak Keyboard Comes with buffered interface. Full-size, with Sinclair legends. Plugs in. Compatible with turther add-ons. $\$ 99.95$ (055)
SL-6 Shift Lock Module Speeds typing, allows one-finger entries. Aids the handicapped. Touch sensitive switch automatically holds SHIFT "ON" for one second, (adjustable) long enough tor $3-5$ key entries. Solders inside computer case. Has LEO to indicate "ON". All parts included except a touch-contact (screw-head, wire, rivet).
$\$ 12.99+\$ .75$ s $8 \mathrm{~b}(110)$
Tactile Feedback Keyboard Overlay Clear vinyl with holes over each key. Feel the keys. Adhesive backed. Speeds keyboard use. $\$ 3.95$ (109)
Typex/61 Clear vinyl selt-adhesive overlay. Rectangular "key" openings permits touch-typing. Speeds programming and improves game-playing.
$\$ 5.95+\$ 1.50$ p\&h (031)

## Memory

Basicare Drom (Requires Basicare Persona) Ulitra low power memory with battery backup (rechargeable). Save programs under development or frequently-used routines or data. Individual 2 K blocks can be protected accidental overwriting.
$\$ 74.95$ (032)
Basicare Minimap (Requires Basicare Persona and 64K) Key module for adding large amounts of memory. Extends 64 K address space up to a possible 1 Mbyte. Organized into up to 16 vertical 64 K pages. Can be defined dynamicatly from within a program.
$\$ 59.95$ (032)
Basicare RAM 16 (Requires Basicare Persona) (Minimap Optional) 16 K of add-on memory. Onboard address decoding permits simultaneous use of many RAM 16 modules in conjunction with MINIMAP.
$\$ 49.95$ (032)
Basicare RAM 64 (Requires Basicare Persona and Minimap) Four blocks of 16 K , all of which can be used simultaneously under the control of MINIMAP.
$\$ 149.95$ (032)
Cramic-61 16K RAM Uses CMOS technology for permanent data retention. Can be removed and retains data. Loads almost instantly. Virtually zero error.
$\$ 179.95$ (032)
DK'Tronics 64 K Memory 56 K usable. $8192-16384$ block is switchable by moving a link. Compatible with 2040 printer. $\$ 111.80$ (040)
Dream-81 64K RAM Gives your computer the total amount of RAM its processor can address. $0-16 \mathrm{~K}$ area is de-selectable. ROM socket may contain up to 16K (27128) of EPROM. Ouickly loads from EPROM to RAM, error-free. $\$ 169.95$ (032)
EPROM Cartridge Kit All the parts necessary to build a plug-in cartridge that will accept 2716 , 2732, 2732A or 2764 EPROMS. Memory mappable in 4 K or 8 K increments in $0-16 \mathrm{~K}$. $(0-32 \mathrm{~K}$ without RAM pack.)
$\$ 16.95+\$ 2.00$ p\&h
$\$ 8.50$ bare board only (115)
EPROM Programmer Assembled Assembled and tested. (See kit.) $\$ 59.95+\$ 3.00$ p \& (115)
EPROM Programmer Kit Complete kit. Compatible with 16 K to 64 K memories. Requires a 30 volt or greater power supply capable of delivering 50 ma or mose - schematic included. Adapter needed tor some RAMS.
$\$ 49.95+\$ 2.00 \mathrm{p} 8 \mathrm{~h}$ (115)
EPROMS 2732, 2732A and 2764 EPROMS. Write for prices and availability.
(115)

Gladstone 64 K RAM Adds programming power to your computer. Maximum capacity. Completely reliable, warranted for 6 months.
$\$ 99.95$ (032)
Kayde 16K RAM Will not wobble. Compatible with T/S2040 printer.
$\$ 39.80$ (040)
MK IV Memory 16K RAM Battery back-up guards against memory loss due to power fluctuations. Provides up to 30 minutes of operating power.
$\$ 74.95$ (008)
MK IV Memory ( 64 K ) Features switchable battery back-up. Also has switches to control the $8-16 \mathrm{~K}$ area of RAM. Compatible with hardware and sottware requiring the $8-16 \mathrm{~K}$ area. EPROM socket can be assigned any address.
$\$ 158.95$ (008)
MX $\mathbf{- 1 6 K P} \quad 16 \mathrm{~K}$ RAM module. Built-in output connector tor piggyback.
$\$ 49.95$ (086)
MX - 64 KP 64K RAM module. Built-in output connector for piggyback. $\$ 119.00$ (086)
Memic-61 A 4 kilobyte RAMpack which can store programs without power. Tiny power requirement is met by a lithium battery. Resides in the $8-12 \mathrm{~K}$ area of memory map. can be moved within the $8-16 \mathrm{~K}$ region.
$\$ 69.96$ (032)

Nonvolatile Memory Designed to fit in the $8-16 \mathrm{~K}$ area. Retains data when the computer is powered-down. Store BASIC programs or build a library of MC routines and system utilities.
$\$ 32.95$ - kit with 2 K memory $\$ 18.00$ - three additional HM6116LP - 3 CMSO RAM's + \$1.95 s\&h
(038)

ROM-61 ROM reader. Instantly calls up programs. Provides two 24 -pin sockets for up to 8 K of memory expansion. Two 2716's or 2732's can be mapped into the $8-16 \mathrm{~K}$ area.
$\$ 34.95$ (032)
Sin 16 Uses $30 \%$ less power than other RAM's. Fully compatible with other plug-ins. Long life. Best connector on the market. $\$ 35.00$ (101)
Sinclair 16K RAM The original memory addon.
$\$ 47.60$ (040)


64K Memopak Oirectly aocessable. Runs 16 K programs unaltered. Oesign allows maximum array capacity.
$\$ 149.95$ (055)
32K Memopak A full 32 K of directly accessable RAM. Holds an extended data base. Compatible with other add-ons.
$\$ 99.95$ (055)

## Printers <br> (\& Accessories)

Inkitf Re-inking kit for all printers with continuous tabrlc ribbons in separate housings. Increases ribbon life by five times or more. Comes with instructions and all pigment matrix printer ink. High quality results.
$\$ 6.95$ (087)
Memopak Centronics Parallel Interface Interface for parallel printers of the Centronics type. Fully compatible with Sinclalr BASIC.
$\$ 74.95$ (055)


Paper For 2040 Printer Prints blue on white. Three rolls per package.
$\$ 14.40$ (040)
Printer Interface (For Axiom GP-100A printer. Requires Prof. Electronics 1/0 Board, Hunter Products 8K RAM module \& 16K RAM pack.) Hardware with tape. Uses ports A \& B of the 8255 I/O Board. Printer commands and MC stored in 8 K CMOS RAM on Hunter board. $\$ 30.00$ cable, instructions, programs \& cassette. $\$ 30.00$ assembled Hunter Board.
$\$ 45.00$ I/0 Board (066)
Prowriter Model 8510 (Requires Centronicstype parallel interface.) Full feature programmable dot matrix prinfer. Six alphabets, exceptionally dense print quality, graphics capabilities, bidirecfional printing 120 characters per second, up to 136 columns. One year warranty. On sale for $\$ 399.00+$ $\$ 11.95$ s\&h
(100)

Report Generator ( $\mathbf{1 6 K}$ ) Oata acquisition and control board. Printer interface (centronics). Real time clock/calendar with battery backup. 8-BIT in and out ports. CMOS A/D converter, 8 channel, 8-BIT. BUS connector for RAM pack. ROM resident firmware. $\$ 79.95$ assembled \& tested.
(026)

Seikosha Full Size Printer Package (RAM with switchable $8-16 \mathrm{~K}$ area required.) 80 -column dot matrix printer. Upper and lower case letters. Automatically fills lines. Just plugs in. $\$ 339.95$ (008)

Sinclair ZX Printer Paper Silver-colored. Packs of three rolls.
$\$ 11.00$ (040)
Smartface Printer interface. For use with parallel or serial printers. Uses no RAM. No user routines. Compatible with other add-ons. \$109.95 specify printer model. Pin Out and plug requirements.
(009)

T/S2040 Thermal Paper Superior texturesimilar to regular white stationery. Specity blue or black print. 85 feet by $4 \frac{1}{4}$ inches.
$\$ 5.95$ per roll (008)
Therma-Print Paper For the T/S2040 printer $\$ 9.15 / 4$ rolls ( 82 feet) black print. $\$ 7.80 / 4$ rolls ( 82 feet) blue print.
Timex 2040 Printer
$\$ \$ 89.95$ (086)
2040 Printer Paper Prints black on white. Three rolls per package.
$\$ 23.00$ (040)
ZX81 Printer The original. Uses 4 -inch silvered paper.
$\$ 119.60$ (040)
ZX Printer Full alphanumerics ant sophisticated graphics. Copy command print screen display. 50 characters per second, 3 characters per line, 9 lines per vertical inch. Com patible with other add-ons. One roll of paper includ ed.
$\$ 79.95$ (032)
ZX Serial Printer Interface Connects your computer to any serial printer. Outputs an ASC II RS-232 signal through the MIC port. Software is 256 bytes of relocatable MC. Hardware parts cost about $\$ 10.00$. Requires one connection inside the case. $\$ 5.00$ for plans and listing.
(105)

## Programming Aids

A/D - D/A Board (Requires 1/0 Expansion Board.) Provides two channels of ADC and two channels of DAC. 8 -bit resolution is obtained in 100 microseconds. I/O command requires a single line of PEEK or POKE. Sample programs provided, with simple application suggestions.
$580-05-10221$
ati Crash Bracket Holds the computer $2 x$
Anti Crash Bracket Holds the computer, $2 X$ printer and 16K RAM
$\$ 4.00$ (040)
BCS Board Beeper, clock and switchboard. Provides facilities for timing, periodic input or measurements, manual stop/start and sound alert. TSU SHOPPERS' GUIDE

Sample programs included for introduction of features.
$\$ 79.95$ (032)
Basicare Toolkit (Requires Basicare Persona.) Accepts up to 8 K of utility programs in EPROM/ROM. In address space atter on-board ROM. Allows for calling TOOLKIT - held routines via the USR function. $\$ 44.95$ (032)

BLOPROM-81 EPROM programmer with new "friendly screen" approach to instruction. User notes almost unnecessary. Professional features.
$\$ 179.95(032)$
Byte-Back Control Board Controls up to 8 channels, each one to 250 volt, 1 Amp. Has its own power supply
$\$ 71.80$ (040)
Compuserve Starter Package Everything you need to sfart with COMPUSERVE OATA BASE including manual, 10 number and 5 hours time.
$\$ 35.00$ (040)
Data-Assette Zx99 Automatic Tape Controller Controls up to 4 tape recorders through their remote jacks. Allows merging of programs and creation of a large data base. $\$ 171.60$ (040)
Data-Assette ZX21 Metered Cassette Interface Gives a metered indication of sound level to help with tricky problems.
\$19.80 (040)
Eprom Programmer For 2516, 2532, 2716, \& 2732. Put your programs in EPROM. \$44.95 (032)


Hargrave Superdata Save System ( $\mathbf{1 6 K}+$ +) Combination of hardware and software that loads 16 K programs in 30 seconds. Verifies saves, scans tapes and prints names of programs gives bytes remaining, renumbers basic lines in Heow Hen. Has abrohate lack__ $\$ 13.20$ (040) دDBSFREset thetton Pofocme cuctam recet Re-



Rayde 4 K Tool Kit ROM Plugs into KAYDE GRAPHICS BOARO. Located in $8-16 \mathrm{~K}$ and occupies lines 9990-9999. Functions are HELP, RENUMBER, BUYTES FREE, COPY, DELETE, KEEP, INSERT, ALTER. FINO MOVE and VERIFY. $\$ 19.60$ (040)

L-Monitor Assures first time LOADS. Sensitive, reliable microammeter. User adjustable. Output for earphone or duplicating. Comprehensive instructions. Head alignment function. \$23.50 assembled and tested. $\$ 17.50$ kit postpaid first class mail(046)

Level-VU Prism Line-of-sight visibility and magnification of cassette tape counter. Attaches easily to the recorder body or lid.
$\$ 2.95+\$ 1.00$ p\&h (047)
Mem-Minder Quick reference card fits on top of your computer. Contains a graphic memory map. report codes, system variables, PEEK and POKE formulas, room for 16 of your own addresses. Aid for graphics and machine code programming. Durable.
$\$ 4.50$ (109)
Personal Software Services Q-Save Cassette filter/amplifier interface between computer and recorder. Cleans signal. Loads 16 K in 29 seconds, 48 K in 110 seconds. Signal

overload LEO and save verify feature. $\$ 42.16$ (040)
Ramstrap Sturdy strap secures RAM to the computer, prevents crashes. $\$ 3.00$ (U.S.) $\$ 3.50$ outside U.S.A
(070)

TP-1 Recorder Control Plans Circuit schematic for easier tape recorder use. Ends cable plugging and unplugging. Built-in microphone for voice labelling tapes. Low level load monitor speaker. Radio Shack parts cost approximately \$20.00. Some electronic "know-how" required.
$\$ 5.00$ (068)
Tape Loading Aid Three LEDs indicate correct loading volume level. Earphone jack permits audio monitoring. SAVE/LOAD switch. Resets to "K" $\$ 33.00$ (earphone $\$ 3.50$ )
(015)

Tree-Forth (2K RAM) Chipbased FORTH language ROM replacement. Multi-tasking. Controls 10 functions simultaneously. Almost as fast as machine code and understandable like BASIC.
$\$ 49.95$ (081)
Vu-Load Monitor Enables to observe and adjust for the optimum level of cassette output signal. Gives positive save indication with automatic level control cassettes.
$\$ 29.95+\$ 2.50 \mathrm{p} \& \mathrm{~h}$ (047)
Winky Board II Helps load difficult tapes. Monitor lights indicate volume level. Earphone jack to hear program. Can save two cassettes simultaneously. Cleans up noise. Use in tape head alignment. $\$ 19.95$ assembled \& tested. $\$ 19.95 \mathrm{kit}$ $+\$ 1.00 \mathrm{~s}$ \& h
(075)


Z-Dubber Cassette-computer interface. Improves signal for loading and saving. Allows you to connect two recorders together to make high quality back-up tapes.
$\$ 31.95 \mathrm{ppd}$. (104)

## Sound

Bach Box III Full feature musical synthesizer circuit board plugs into back of computer. Three voices with all processing including multi-modal filter. Sound effects or serious music. External input permits use of filter for other instruments.
$\$ 39.95 \mathrm{ppd}$ (072)

DCP Speech Pack Contains all letters of the alphabet, some general words and numbers from zero to over one million. Uses POKE commands Compatible with other add-ons. Contains speaker and volume control. Extend the vocabulary with additional Work Pack ROM's
$\$ 99.95$ (032)
The Parrot ( $\mathbf{1 6 K}$ ) Plug-in module. Generates all 64 discrete sounds of the spoken English language. fncludes sottware which strings together and pronounces these sounds. Compatible with other addons. Output jack for speaker.
$\$ 59.95+\$ 4.00$ s\&h (073)
Zon X Sound Unit Plugs-in. Completely selfcontained. Designed specifically for T/S computers. $\$ 49.95$ (032) (040)


## Utility

## Adapter Kit For Programmer To Non Feed

 Through Memories Such as required in the EPROM PROGRAMMER KIT for RAM packs similar to TIMEX or SINCLAIR - without connectors on the back. $\$ 14.95$ (115)Byte-Back Modem Stackable modem with RS232 port and sottware. $\$ 191.00$ (040)

## CS-1 Timex 1000/Sinclair ZX81 Schematic

Diagram
$\$ 5.00$ (068)
Car Comp Power Kit Rigid platform for use anywhere you have AC power or a 12 -volt cigarette lighter outlet. Voltage regulator tor steady input voltage. Computer, cassette recorder and power flat fit in a standard 4 -inch deep briefcase.
$\$ 59.95+\$ 3.00$ p\&h (047)
Compusette Computer Grade Cassettes C-05 59¢ each, C-10 69c each. C-15 79e each, C-20 89c each, C-30 \$1.09 each; add $\$ 3.00$ per pack of 2 dozen for $\mathrm{s} \& \mathrm{~h}$.
(056)

DK'Tronics Ribbon Cable Attaches wide memories to the output bus when using the DK 'TRONICS full size keyboard. Gets rid of wobble problems when using Sinclair memories or heavy add-ons.
$\$ 15.50$ (040)
Deck Calibrator Lab quality tape of precise trequency and burst times to check captan speed. Helps reduce load \& save problems.
$\$ 9.95$ posipaid (002)

## EC-1 46 Pin Edge Connector Fits the expan-

 sion port on the T/S1000 - 2X81.$\$ 7.00$ (068)
Easy Eraser Simulate with documentation. Short UV bulb and easy-to-tollow instructions. User should have some mechanical and safety knowledge. $\quad \$ 19.95+\$ 2.00 \mathrm{~s} \& \mathrm{~h}(002)$
Easy Eye Filter Optic yellow screen filter, front-mounting. Sharpens image, reduces eye strain. Includes instructions, fasteners and viewing tips. $\quad \$ 12.95+\$ 2.00 \mathrm{~s} \& \mathrm{~h}(002)$
Edgeboard Connector, Piggy-Back PC Board 44 pin wire-wrap edgeboard connector, 16
keyed, with bifurcated contacts. Manufactured by T.f. PC piggy-back extender board. Use for economical experimenting. instructions included Edge connector $\$ 5.00$. PC board $\$ 1.50+\$ .75$ s\&h
(038)

8-Channel Digital Voltmeter Board (Requires Protessional Electronics I/O Board, external 5 volt power. 16K RAM, Hunter RAM Board.) Shows displays of eight channel voltages. Based on the MC-14433 DVM chip. Input protection. $\$ 147.50$ (066)
Floppy Disc Drive Interface ( $\mathbf{1 6 K}$ ) Single or double density or sides. One or two drives. SAVE/LOAO at $125 \mathrm{~K} / 250 \mathrm{~K}$ bits per second. DOS in ROM uses no PEEKs, POKEs or USR commands. All functions from BASIC SAVE/LOAD commands.
\$189.00 (015)
Floppy Disc System Uses Model FDCS Disc Interface. Single or Oual Orive. 250K bytes storage per drive. Complete with interface, disc drive (second optional) drive power supply and case. $\$ 499.00$ (second drive \$228.00)
(015)

Hardware Package Sinclair $2 \times 81$ with KAYOE GRAPHICS BOARD, AUDIOGRAPH CHIRPER, CHIRPER ON/OFF and SYSTEM RESET installed. Quantities limited. May substitute T/S1000.
$\$ 120.00(040)$
I.D.S. Edge Connector 23 -pin temale edge connector with wirewrap pins.
$\$ 4.10$ (040)
I.D.S. Edge Connector 23 -way male edge connector. $13 / 4$-inch long. One end notched. Alf traces parallel.
$\$ 2.10$ (040)
1.D.S. Power Supply 9 volt DC, 1 amp. $\$ 16.00$ (040)
I/O Board 8255 PIO Board. 24 lines (3 ports) for input or output. TTL level lines can be used tor driving external devices. Compatible with peripherals.
$\$ 45.00+\$ 2.50$ s $\& \mathrm{~h}$ (066)
I/O Ports and EPROM Programmer Plans Schematic documentation and sottware listing to build and use a 24 line I/0 port. Requires only an LM317T and one SN2222A transistor plus assorted resistors, etc. Verification software included. $\$ 5.00$. $\$ 17.95$ bare PC board with assembly instructions.
(115)

Joystick Plugs into the E-Z Key 60 keyboard.
$\$ 29.95$ (108)
Kote Jack Jelly compound retards oxidation, fungus etc. inherent in low level metal transter interfaces such as jacks and edge connectors. 1/2 ounce with applicators and instructions.
$\$ 5.95+\$ 1.00$ s\&h (002)
MK IV Modem Includes smart sottware for automatic down-loading to printer or memory. Connects to extension phone jack. Simply dial another computer, hang up and it telecomputes. Uses the $8-16 \mathrm{~K}$ region - 64 K RAMs must be able to switch this area "off". Instructions included. $\$ 189.95$ (008)
PS-1 Power Supply Schematic Schematic of more powerful power supply design. Greater reliability, better line noise immunity. More available power for system expansion. 5 volts and up to 4 amps .
$\$ 5.00$ (068)
Plotter Worksheet ( $\mathbf{1 6 K}$ ) Not a program. Plot screen displays
$\$ 6.70$ (040)
Programmers Toolkit and Graphics Routines Cartridge ( $16 \mathrm{~K}-64 \mathrm{~K}$ ) Cartridge plugs between the computer and RAM pack or printer. 4 K EPROM mapped into the $12 \mathrm{~K}-16 \mathrm{~K}$ memory area. Provides 8 programming aids, titteen graphics commands. Detine up to 255 figures. Use all 24 lines ot screen.
$\$ 34.95+\$ 2.00 \mathrm{p} \& \mathrm{~h}$ (115)
Ribbon Cable Six-inch, primarily tor use with 16K RAM modules. Stabilizes RAM against " wobble crashing " Specity female/female or male/temale plugs
$\$ 19.95(008)$


Samwood Monitor Provides a better picture than a TV monitor. Composite video input/output. Switchable input impedance 75 or 10 K ohm. 750 -line resolution at center, 500 fines at corners. Orange: $9^{\prime \prime} \$ 11.90 ; 12^{\prime \prime} \$ 127.00$. Green: $9^{\prime \prime}$ $\$ 115.00 ; 12^{\prime \prime} \$ 124.00$
(086)

UHF Conversion Kit Converts your RF output to channel 33. UHF which is virtually immune to interference. Results in very clear picture. Some soldering. Instructions included. $\quad \$ 19.95$ (008)
Video Command (Requires AGF Interface or Joystick Port.) Joystick. Can be used with one or two hands. Atari plug compatible. Long cord and easy movement.
$\$ 16.00$ (040)
Votem/Analog Interface High resolution analog interface. Better than 14 -bits. Connects to tape input. Expandable voltage range. Includes semiconductor temperature probe and detailed user's manual with software listings. Extra memory recommended.
$\$ 39.95$ Kit (023)
$\$ 59.95$ assembled + \$3.00 s\&h. User's Manual $\$ 5.00 \mathrm{ppd}$. - applied to first purchase.


ZText - Seikosha Modification Instructions Complete instructions for modifying the ZTEXT word processor program to give 80 -character printout on the Seikosha printer. Includes upper and lower case letters and double size printout.
$\$ 3.00 \mathrm{ppd}$. (008)
c. 0

CONTINUED NFXT MONTH THE RESPONSE TO THIS FEATURE HAS BEEN OVERWHELMING - SO MUCH SO THAT WE RAN OUT OF SPACE. WE WILL CONTINUE THIS LISTING NEXT MONTH. THANK YOU T/S SUPPLIERS

 game (T/S1000,ZX81, 16K).



## 

AVERY frustrating game has been sent by Christopher Wysocki. It is called Shooting Range and involves firing at a range of constantly-changing letters.
The letters have values ranging from one for A to 26 for Z and the aim is to achieve as high a score as possible. A time-limit is imposed by a gray square which travels along the row of letters and the game ends if it is not shot down before reaching the end of the rows.
It is a simple program and because of that the movement of the bullets from the gun is slow and
only one shot can be fired at a time. That makes it difficult to hit the gray square, as you have to anticipate its position in good time.
Throughout testing, our reviewer found it impossible to hit the gray square but still managed a high score of 314.
The gun is moved to the right and left by the cursor keys and the upward cursor, key 7, is used for firing. Graphics notes:

Line 70, a shifted Q with a space on either side and shifted 3 with a


```
        B REM "GUNNER",
        B REM "GUNNER",
        B REM "GUNNER",
        B REM "GUNNER",
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        B REM "GUNNER",
```



## BEYOND 64K... Would you believe up to ONE MEGABYTE?

Memory expansion is only the BEGINNING of the possibilities available through BASICare ... the ONLY expandableexpansion system for Timex-Sinclair computers.
This is a unique flexible 'Building Block' expansion system that enables you to expand your system in any configuration you choose.

BASICare modules are what is required to turn any Timex Sinclair into a serious computer for business, education, industrial, and hobby applications. Your system can grow gradually as you can add new functions when and as required. In order to open the door to this exciting new world of expansions you require a Persona module. It simply (and firmly) plugs into your computer. No soldering. No modifications of any sort!
BASICare uses a unique 64 way Organic Bus. This bus is the pathway to all modules. You have INSTANT access to all modules simply and easily thrpugh the PEEK and POKE commands.
Memory can be added AS REQUIRED in blocks of 16 K or 64 K up to one MEGABYTE. This is memory that is INSTANTLY AVAILABLE. This is unlike any other system available for a home computer and compares in capability to multi-lasking systems costing thousands of dollars!
You can grow gradually, adding memory or other functions as you need them. Just think of the added power expandable memory will provide!
The PERICON modules add input Output functions like driving relays, LED's or a Centronics type printer.
The DROM offers a PERFECT alternative to tedious cassette saving and loading by holding your programs and data in nonvolatile RAM.
These, combined with the other BASICare modules, put YOU in complete control.

PERSONA: -interface module to enable BASICare to grow on your computer $\$ 59.95$ MiNIMAP:-Memory mapping to extend the address space beyond GAK to 1 Megabyte. \$59.96
RAM 16:-16K add-on memory. \$54.95
RAM 64:-a TRUE 64K addon memory. \$149.95 DROM (2K): -Ultra low power memory backed by a
rechargeable battery for nonvolatile storage of programs and data. $\$ 74.95$
USERFONT: -Provides user delinable characters for DROM and TOOLKIT. \$17.95

PERICON a:-A generalpurpose, user programmable device providing 24 lines of input output. \$54.95 PERICON b: -24 lines of heary duty output to access and control the outside world. \$ 59.96
PERICON c: -To drive an 80 column printer with Centronics type parallel interface. S74.95 SONUS: - Three voice music sound synthesizer with independent ervelope control under BASIC commands. \$59.95
TOOLKIT:-An 8K module of utilties in EPROM ROM Sthes

GROW UP TO REAL COMPUTING. With BASICare's Modular Expansion System the modules will never become redundant. If you eventually change to a bigger, more powerful computer, the chances are that we will have a Persona interface to allow you to use your modules on the new equipment.

To order call toll-free 800-833-8400 In New York call (716) 874-5510.
The phones are open 9AM - 10PM (E.S.T.) Monday to Friday. Call or write for further information. BASICare is available direct from 5 E ELECTRONICS and from selected dealers. 1585 Kenmore Ave., Buffalo, NY 14217

# Making A Good Thing Even Better 

> The T/S1000's membrane keyboard has been called its worst feature, but it is part of the reason the T/S is so inexpensive. A few months ago Timex Sinclair User took a good hard look at add-on keyboards in the feature " 6 Keyboards Compared." Now we take a closer look at the assembly and operation of the dk'tronics keyboard. By Gillam


Few Problems, Many Advantages The dk-tronics replacement keyboard, despite a few problems, offers the advantages you'd expect from a full-stroke typewriter style keyboard, plus a separate numeric pad for convenient number-crunching.

WHAT COULD BE BETTER than a full-stroke replacement keyboard for your Timex Sinclair computer? How about one with a separate numeric pad, plus room inside the case for RAM expansion, power supply and switch, and maybe a few other goodies as well? If that appeals to you, check out the dk'tronics ZX keyboard: it does much to overcome problems inherent in the

ZX81 and T/S1000 original membrane keypad. Though it has some problems of its own, they are not insurmountable, and, depending on your facility with hand tools, your patience and your intended usage of the computer, this accessory keyboard may well be an improvement worth your money.
To start with the obvious, I must say that I'm very pleased with the feel and response of the dk 'tronics
keys. They are similar to the keys on my IBM Selectric typewriter, though they lack the IBM's "snap," which is due to the mechanical movements within the typewriter. And the 12 -key numeric pad is a valuable boon for users who have business programs for their computers and who like to program in machine code as I do. The full-size keyboard allows the user to hold his fingers in touch-typing or calculator positions; that plus the full-stroke movement of the keys allows faster programming - not because the computer accepts input any more quickly, of course, but rather because the user is more confident and faster at supplying the input. The numeric pad is actually a repeat of the 10 number keys (with the corresponding cursor controls, other shift functions and graphics characters) plus an additional shift key (handy for right-hand use when shifting a lefthand character) and another period/comma key (for decimals, naturally, and dandy for POKEs too). One thing the ads do not mention is that the keys as supplied are unmarked. The legends are printed on a sheet of die-cut, pressuresensitive clear plastic film which the purchaser must apply to the keys himself. The printing is on the sticky side of the sheet, so it is not likely to rub off with use.

The case provided is considerably larger than the original ( $15-\mathrm{in} . \times 9.5-\mathrm{in} . \times 2.5-\mathrm{in}$. ) which is an advantage in my opinion: it makes it easier to balance the computer on my lap for lazy use. The top and sides are molded from some sort of low-density plastic that appears to be quite sturdy - it survived the United States Mail from New York to Alaska, protected only by a flushfitting corrugated cardboard box. The bottom of the case is plywood; inside is a motherboard, which connects to the computer's printed circuit board at one end, a RAM expansion at the middle - joy and jubilation! no more wobbly RAM-pack! and any other edge-connecting peripherals at the other end, through an opening at the back of the case. The keys are mounted on a printed circuit board of their own, which is attached to the upper part of the case. Their signal is sent to the computer via a dual ribbon connector that snaps simply into place.
The computer printed circuit board attaches to the baseboard using three screws from the T/S,ZX case. Blocks are provided for mounting the board, but I didn't find the hole markings mentioned in the ads. The screws are not woodscrews, so I had to drill pilot holes before mounting the board. The mounting screws should not be any more than barely snug because of components located on the underside of the board, they are not meant to be tightened down flush to the baseboard. The channel selector switch becomes a support leg, and must be set to the desired position before closing the case; afterwards, it is virtually inaccessible. The computer board's position is determined by the position of the motherboard, which it plugs into. In the case I received, the holes in the back did not align with their intended plugs, and I had to modify them to get the television and power jacks to fit the sockets. This was simple to do as the material of the case can be easily cut and filed.
Further modification of my case


Keyboard Eliminates RAMpack Wobble The Timex Sinclair 1016 16K RAM expansion unit (or any third-party RAMpack) can be uncased and plugged onto the motherboard inside the case, eliminating wobble and resultant program loss.


Internal Layout The computer's printed circuit board (A) mounts inside the bottom of the case and plugs into the motherboard ( $B$ ), which is factory installed. The ribbon connector (C) supplies the signal from the keyboard. The power converter can also be installed in the case but should be attempted only by those with a good understanding of the dangers of electricity and the need for insulation.
was necessary to make the keyboard fully functional. The printed circuit board on which the keys are mounted was cut obliquely, resulting in a poor fit with the case. As first supplied, the shift key locked in place every time I pressed it. I found that this was due to the board being mounted crookedly, forcing the shift key hard against the edge of the cutout. After reopening the case and dismounting the board, I was able to quickly file the opening larger to accommodate the shift key without interference. However, the nonrectangularity of the board aggravated another problem: two of the eight mounting screws meant to hold the board to the case were absent due to their holes lining up with empty space instead of with the case as the designer had apparently intended. Thus, whenever I used the shift, $\mathrm{A}, \mathrm{S}$ or Z keys, the keyboard would sag. The keys functioned properly, but it slowed me down a little, and I feared that continued bending might eventually cause damage to the board. I solved the problem by adding a retainer to a screw in the corner hole (a washer would work as well), which overlaps the board and holds it firmly.

Altogether, the assembly as described in the instructions and my adaptations took me less than two hours, and that includes solving the problems outlined above, and applying the 52 small patches of plastic to identify the keys.

In many ways, the dk'tronics keyboard is an improvement on the original, but it could be vastly improved by more careful manufacture. It's one of only a few keyboards for the Timex Sinclair computers that offers a separate numeric keypad, and that - plus the real typewriter keys - make it worth the price. Its value could be further enhanced by increasing the number of keys available on the numeric pad - the arithmetic functions ( $+,-, *, l$ and $=$ ) for example, or the A through F keys for machine code hackers. Dk'tronics, are you listening?

# Honalore Durable 

## Dave Hakes evaluates the Memotech keyboard

THE MEMOTECH KEYboard is one of the best looking and best working keyboards I have ever seen. The quality is ex cellent (which seems usual for Memotech). The encasing is aluminum, for durability and strength.

As with all Memotech products, the keyboard requires no opening of the computer and no voiding of the warranty. The interface module simply plugs into the expansion bus; other peripherals can be installed in its plug in the rear. The keyboard connects to the interface with a $12-\mathrm{in}$. ribbon cable: if you plan to use the keyboard next to the computer, the length will be no problem, but it isn't quite long enough to allow you to move the computer completely out of the way to give yourself more room.

The keys require almost no pressure from your fingers to engage the switch. They are spaced a little too close together, and wobble a bit, which is somewhat annoying. Excluding SHIFT combinations, nothing happens when you press more than one key at a time. This means that you can't press ENTER until you've removed your fingers
from the keys. This is not a major problem, though.

I was surprised to find that Memotech did not create a separate space bar: after all, what is a typewriter or computer without a space bar? They made up for their mistake with an extra shift key in the upper right hand corner, where it greatly simplifies using the delete, graphics and cursor control keys. Considering how much the shift key is used on Timex Sinclair computers, this is a wonderful idea, and I'm glad they thought of it.

The manual is good, and contains an inconspicuous little note to game players that explains that the original T/S keyboard still functions when the new keyboard is operating. This can be used quite nicely in two-player games where both players are needed at the console at the same time.

Despite the few problems, the Memotech keyboard is still highly recommended to anyone who frowns on membrane keyboards. On a scale from 1 to 10 ( 10 being the highest), I would give the Memotech keyboard a rating of 8 .
0.0

Requires No Assembly The attractive aqua-blue Memotech keyboard has no space bar, perhaps its biggest flaw, but is still enough of an improvement over the T/S membrane keyboard that we give it a rating of 8 on a scale from 1 to 10. The T/S keyboard remains operative after the Memotech is connected, an ideal set-up for games requiring two players.


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## CK

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## Internal fixing for ZX 81 keyboard case.



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## SPECTU

16K Memory Eans The 16 K uses 41 byn Static Ram and c,py using the Static $h_{n}$. T speed low poweams the computer. The which comes tor fu where Position men
64K Memory Eans All the above inmati advantage lies irie 6 56 K of usable mory. the use of other d -or 8192-65536. Theock Spectrum Memy E, Upgrade your SPirum it is simply slipperiside are supplied. anke o tume. The fitting juire same as Sinclair opgra

# 2X80-81 Spectrum HARDWARE 

## SPECTRUM/81 TOOLKIT

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fion on the 16 K also applies to the 64 K Memory Expansion, but the ti 54 K giving nearly FOUR times the memory. This advanced model has In addition, the block from 8 K to 16 K can be switched out to enable - is. The graphics ROM is to be used in this area Position in Memory: krom 8192-16384 is switchable.

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it to 48 K of user Ram. The Spectrum memory expansion is simple to fit, the case, and then only requires plugging in. Full fitting instructions only tool you will need is a screwdriver and just two minutes of your es no electronic skills. Position in memory from 32768 to 65536 . (The tade to 48 KI .

The DK Graphic module is our latest ZX 8 I accessory This modute unlike most other accessories fits neatly inside your computer under the keyboard. The module comes ready bult, fully tested and complete with a 4 K graphic ROM This will give you an unbelievable 448 extra pre-programmed graphics. your normal graphic set contans only 64 This means that you now have 512 graphics and with their inverse 1024. This now turns the 81 into a very powerful computer with a graphic set rarely found on larger more expensive machines. In the ROM are lower case letters, Dombs, bullets, rockets, tanks. a complete set of invaders graphics and that only accounts for about 50 of them. there are still about 400 left |that may give you an idea as to the scope of the new ROM). However, the module does not finish there. It also has a spare holder on the board which will accept a further 4 K of ROM/RAM This holder can be fitted with a 1 K/2K/RAM and can be used for user definable graphics so you can create your own custom character sets

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# 2inu 1 IT: Build your own 64K RAM 

## All it takes is two and a half hours, writes <br> Ross Williams

N
EED MORE MEMORY? Shortly after the ZX81 was released, many questions arose that Sinclair's poor technical documentation left unanswered. Memory! Could one add more than Uncle Clive's intended 16K of ram? Quite a few knowledgeable people had said "No, the Sinclair bussing and memory map are too awkwardly structured." Since those times, industry has produced add-on RAM expansions for T/S computers approaching 1 megabyte.
Ramkit is a 64 K RAM expansion project, designed to be easy to build and simple to use. Although the components are available in most electronic shops, there may be quite a bit of travelling and price comparing to do; we suggest you order the complete package of components including the printed circuit board from Gladstone Electronics (see box at end of article). Construction is relatively straightforward with a total assembly time of about two and one-half hours.

## Memory Restrictions

Users should be aware of some of the memory restrictions that T/S,ZX computers place upon the Z80 microprocessor's memory mapping structure. The Sinclair ROM and circuit logic have been set out in a manner that makes BASIC


## Circuit diagram




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Figure 1. Memory Map
programming in certain RAM areas impossible. See the chart in Figure 1. Other functions may be implemented in these memory areas through either fancy machine code programming or unique hardware changes that may mask or restructure the computer's memory map.

Although many memory locations are very restrictive, do not be too discouraged about this. Some of these areas are still quite useful. For instance, in the BASIC ROM addressing area, locations 7680 to 8191 are used by Sinclair for character generation. One could easily write one's own character set, bypassing Sinclair's.

Once Ramkit is connected to the computer, after power-up, it latches onto the memory map by controlling both the ROM CS and RAM C/S lines. When Ramtop has been set, there is operational RAM for the selected areas shown by the user. Entry points to the monitor are still available.

## Construction

If you are building the circuit board, use the layouts provided in this article. See Figures 2, 3 and 4.

The plastic case does not allow the usage of IC sockets due to sizing. Experienced builders should have no difficulty in soldering the chips directly onto the circuit board. We suggest that novices should first consult reading

| 65536 | 64 K | Screen Display Area <br> BASIC variables and <br> arrays. Mirror Image <br> of 16K RAM |
| :---: | :--- | :--- |
| 49152 | 48 K | Input/Output data <br> storage BASIC variables <br> and arrays <br> Two Mirror Images must be relocated <br> BASIC or machine code <br> programs here |
| 32768 | 32 K | Opcodes have no access, <br> no machine code here |
| 16384 | 16 K | User RAM, BASIC and <br> machine code programs <br> 16K RAM Module |
| RAM with operating <br> system support <br> ROM and COS. Mirror <br> Image of ZX-81 ROM | No ROM or input/output <br> here |  |
| 8192 | 8 K | ROM usage by supporting <br> addressing <br> RAM for user M/C and Data |
| Sinclair BASIC ROM | Paging ROMs would <br> entail writing O/S <br> software as well |  |

Note: When Ramkit is connected, the internal 1 K ram is disabled by internally shutting the RAM CS line. Programming in the 8 to 16 K region is by machine code only. This area will be safe from the NEW command. Any data stored here must be transferred to another location if this information is intended to be saved. RAM available for BASIC programs and operating system data in shaded area only.
materials covering the basics of component soldering. Set up in a clear area away from carpets and static electricity; it never hurts to be near a well-grounded item such as a
cold water pipe. Before you touch any component, discharge yourself of static by touching the electrical ground; my favorite on such occasions is the telephone - the bottom

Figure 2. Component side of printed circuit board.



Figure 3. Reverse side of printed circuit board.

plate or metal stopper of the dialing mechanism on older telephones works very nicely. After you have collected your components together are ready to start, remember to take the time to properly identify each component and its proper positioning on the circuit board. Two common flaws in constructing electronic gear are a lack of precautionary handling and misplacement of components.
Insert each of the ICs first: simply fit them through the solder masked board into their respective positions. Bend a set of diagonally opposite pins of the IC to keep it from falling out before soldering. It is always best to bend a pin away from a close neighboring component whenever possible. This will aid you in preventing any hazar-
dous solder bridges.
When all of the ICs have been mounted and their positions checked a final time, begin soldering. Mount and solder the rest of the components.
If you have collected your own components through various means, you probably have a length of edge connector which has to be cut down to size. Remember to insert a key in slot 3A/3B. This acts as the guide pin to allow for proper fitting of the RAM when completed.
An optional expansion buss has been included. Although it is not mandatory for Ramkit operation, it is still a good idea to add the extra printed circuit edge connector. After all, there is no sense in limiting your expansion capabilities where all other add-ons
must be inserted before your 64 K RAM.

## Testing

Once final assembly is completed, it is time to try the new memory. Sinclair users with the standard 1-ampere power supply will have plenty of current to power up Ramkit. Owners of the earlier $650-\mathrm{ma}$. supplies are best advised to acquire the heavier unit before connecting their rams.

Ramkit will react visually as do other memory expansions. After powering your computer, there will be a quick glitch on the screen; shortly after, the cursor should appear in its normal position. If your RAM does not perform in this manner, quickly disconnect the power and check your construction. After verifying component layout, check

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solder joints carefully. Dry joints are a common fault.

Before final testing reset the computer's system so that it knows more memory is connected. To set Ramtop for 64 K addressing, enter "POKE 16389,255 ; NEW". Now enter the memory test program (Listing 1). Should any failures occur, the defective memory chip should be identified and replaced. It is advisable to check the RAM select lines before replacement just to affirm your suspicions.
After all seems well, re-enter the test program in Listing 1.

Listing 1. Memory Test

```
10 FAST
20 CLS
30 LET X = VAL " 256"
40 RAND
50 LET Y = X * RND
6 0 \text { RAND Y}
70 FOR I=VAL " 17530" TO VAL
"65535"
80 POKE I,INT (X*RND)
90 NEXT I
100 RAND Y
110 FOR I=VAL " 17530" TO VAL
"65535"
120 IF PEEK I < > INT (X*RND) THEN
PEEKI "FAILURE AT ";l
130 NEXT I
140 PRINT "RAM TESTED OK EXCEPT
WHERE LISTED"
150 STOP
```

Testing the full memory of Ramkit will take about half an hour. The VAL function is used here because of its unique reaction to stray values in variables. Whenever the T/S $1000, \mathrm{ZX} 81$ computer evaluates a numeric string with VAL, the expression must be completely true. If not, the basic operating system will crash the program. When doing a RaM test, it is most important to test each individual byte of memory. This may seem like common sense, as that should be the purpose of any memory check. Some manufacturers and technical writers prefer to use the dimensioning of large arrays (eg. DIM $\mathrm{A}(9000)$ ). These tests
may set arrays of great magnitude, but are unsatisfactory since they do not actually enter and retrieve data in each of their dedicated memory allocations.

## Full Time Testing

If you wish to continually test Ramkit for an extensive period, please make the following changes: 140 CLEAR
150 GOTO 20

## Parts List

| IC1 | 74 LS 32 |
| :--- | :--- |
| IC2 | 74 LS 86 |
| IC3 | 74 LS 10 |
| IC4 | 74 LS 240 |
| IC5 | 74 LS 74 |
| IC6,IC7 | 74 LS 157 |
| IC8 | 74 LS 244 |
| IC9-IC16 | MK4564 N-20 Mostek Dynamic |
|  | RAM 200 ns. |
| T1 | 7805 voltage regulator |
| C1-C12 | .1M decoupling capacitors |
| J1 | 44-pin edge connector |
| PCB1 | main layout board (see Figure 1) <br> EXt1 <br> Extension printed circuit board <br> (see Figure 3) |
|  | Case and assembly screws. |

## Where To Buy It

The complete package of components for Ramkit is available from Gladstone Electronics. The complete kit, including a case, costs $\$ 79.95$ (\$99.95 in Canada). A "barebones" kit consisting of a case, the main printed circuit board, edge card extension and 44-pin connector costs \$24.95 (\$29.95 in Canada). Ramkit is also available fully assembled for $\$ 99.95$ ( $\$ 149.95$ in Canada). Please add \$3 (\$4.50 in Canada) to all orders for shipping and handling. Send your order with remittance to Gladstone Electronics, 1585 Kenmore Ave., Buffalo, N.Y. 14217. In Canada: Gladstone Electronics, 1736 Avenue Road, Toronto, Ontario M5M 3Y7.

# Companies Battling For Survival 

IN WHAT SEEMS like a re-run of the troubles in the United States, there have been reports of the possible demise of the micromarket in the U.K. Grundy Business Systems, makers of the Newbrain, have ceased trading and sales of the popular Dragon have been less than expected.
Against that must be set the news of increased profits for Sinclair Research. They rose by 65 percent to slightly more than 14 million pounds on turnover which was doubled to 55.5 million, compared to last year. Prism Microproducts, mainly because of its distribution link with Sinclair, recorded turnover of 10 million in its first year. Managing Director Bob Denton said the company is moving between 500,000 and 1 million pounds worth of Sinclair goods each week.
In addition, there is the news of the deal for the sale and making of ZX81s in China which opens vast new possibilities. The fact that the deal was agreed to so quickly shows how keen the Chinese must be to take advantage of this new piece of technology and join the computer age. Other business people who have tried selling in that market must be envious at the speed with which the business was transacted.
Despite the similarities between the United States and Britain, the underlying situation is different. The problems on your side of the Atlantic stem mainly from the continuing price war whereas the British difficulties are the result of particular conditions in which the companies find themselves.
Grundy was taking over a machine which was out of date by the time it was launched. What had been a new idea when it was conceived had been overtaken by the Sinclair machines, while its own future was being affected by delays. There is a chance that the Newbrain will survive but the
market for which it is intended will have to be reappraised.
Dragon difficulties appear to be the opposite of those suffered by Sinclair. Instead of underestimating the market, the company was too optimistic of prospects and budgeted accordingly. It is also likely to be under pressure from its parent, Mettoy, the toy maker, which has been looking to Dragon to ensure its future. Last year it had to sell part of Dragon for new finance to enable the company to take advantage of growth prospects in the computer market, but Dragon is still its main source of income.

The lesson from both the problem companies seems to be that although there are great opportunities in the home computer market, it is not immune from the normal constraints of business. No one, not even Sinclair Research, can afford to ignore them, although Sinclair is probably in a better position than most. As it was first into the market, it has had a little more time than others to put itself into good shape, a process which has been proceeding since the company was started four years ago.
That kind of extra time does not exist for the companies which have

$\square \quad \begin{aligned} & \text { familiar } \\ & \text { with us. }\end{aligned}$
since started selling computers. Even the production of a successful machine is no guarantee of business success. Dragon has regularly been one of the top-sellers but that did not prevent it running into difficulties.

As in all businesses, the route to success is to predict demand accurately and adjust supply to meet it. It would appear that demand for home computers is not so easy to predict as some would have believed. With a potential of all the homes in Britain and the sales having reached only about 10 percent of them, it would have been logical to expect that any machine with a reasonable specification and price would sell as fast as they were produced.
Dragon found that was not so. The conclusion to be drawn is that the potential market is not that big, as least not until the price falls to that of a large calculator.
Sinclair experience, however, is that it can sell all its Spectrums, yet the ZX81, despite its low price, is falling from favor. That can be rationalized by saying that Sinclair is in a class of its own and has found its niche in the market for a relatively low-cost machine with relatively high specifications.
The BBC Model B machine is in a similar situation but the rest are chasing what is left.
With more and more machines seemingly arriving every week, the chasing will become ever more frantic until the manufacturers that fail to .get it right have to call it a day. It is unlikely that will happen before Christmas, given the prefestive boom which can be expected. By this time next year, however, following the fall in sales in the beginning of the year, it could be that many of the less familiar names will no longer be us.

## Featore

Fred Blechman outlines the color capabilities of the T/S2068
Color Me Gorgeous!


## Feature

0NE of the big new features of the Timex Sinclair 2068 personal computer, compared to the T/S1000 and T/S1500, is C-O-L-O-R! While color is not particularly important for most simple computer functions, it has become almost a necessity in games, together with sound. Our emphasis in this article is not on games, but there's no doubt that color can enhance almost any program. This article refers to the T/S2068. You'll learn enough about the color capabilities of the T/S2068 computer to allow you to become somewhat of a "pixelated Picasso."

## The Color Signals

Although all the promotional information on the T/S2068 mentions eight colors, there is seldom mention of the fact that there are two distinct BRIGHTness levels, so there really is a perception of 16 colors.
First, however, we must clarify what can be colored and what cannot, and how well these colors can be viewed. For example, if you're using a black and white television as a display, then you will see colors as shades of gray - and even these won't show up too well unless you tune the brightness and contrast controls for the best distinction. (These control settings will probably not be the same as for the best television picture).

## Using A Color TV Receiver

If you're using a color television set, you'll be feeding the 2068's "TV" modulated RF signal into the antenna switch box supplied with it. You'll be distracted by "crawlies", wiggly lines that are pervasive throughout the picture, and particularly noticeable on borders between colors, but you'll learn to live with them.
It's important that the antenna switch box has the switch in the

[^2]"Computer" position and not the "TV" position. Also, be sure the channel selector is set to the same channel (2 or 3) as the switch under the T/S2068 and then tune for the clearest picture. If you don't get a good picture, try the other channel (remembering, of course, to move the switch under the 2068).

## Color Monitor

If you use an NTSC (National Television Systems Committee standard used in the United States) color monitor, you'll have an improved display. Connect the video cable supplied with the computer from the computer's MONITOR output (on the back of the 2068) directly to the color monitor's video input. An adapter plug may be required if the monitor doesn't have an RCA-type video input jack. The antenna box is not used with a monitor. Using a monitor rather than a television set won't absolute-
ly eliminate crawlies, but it greatly cuts down their population and size!

## The Color Palette

There are various commands/statements that effect the color of the display and each picture element (pixel) on the display. Figure 1 shows the various areas of color and the associated BASIC control words. The BORDER, for example, surrounds the usable area of the display, and is controlled directly with the BORDER number. This can be done from the keyboard (which is then called a "command") or within a program (when it's called a "statement").

## paper And ink

The usable area has a background color called PAPER, on which the printing occurs in an INK color, which certainly makes sense. So, whenever you PRINT anything, it's printed in the InK color on the

Figure 1. Display.


PAPER background of the usable area ( 22 lines) surrounded by the border color. The additional two display lines, normally used for EDIT, INPUT and program line entry, are the current or previous BORDER color.
Each character space on the 32-character line has a PAPER color, and every pixel in that space ( $8 \times 8$ $=64)$ has that color unless PRINT, DRAW, PLOT, INVERSE or OVER have caused that pixel to assume the Ink color. The most important thing to remember is that there is only one PAPER color and one INK color for the entire character space at any one time. Each PAPER or INK color can change, but then it affects every other PAPER or INK pixel, respectively, in that character space.
The other thing to understand is that each pixel can be in only one of two states - either the PAPER color (in which case it is sometimes referred to as "off") or the ink color ("on").

## What Are The Colors?

Your T/S2068 keyboard shows the colors above eight of the keys on the top row. It is not coincidental that these colors are referred to within the 2068 by the numbers of those keys! For example border 3 is magenta, and BORDER 6 is yellow. The same system applies to all the color commands, so you don't need to memorize the color codes or look in a book - they're right on the keyboard.
Type and Enter Listing 1 for the color "palette" - the eight different colors, and their two BRIGHTness levels. Line 110 starts a FOR-NEXT loop, setting the variable p equal to 0 to start, and counting up to a value of 7. This line also sets PAPER to the value of $p$. That means the next PRINT statement will change the PAPER color. Notice that no INK color is specified - mainly because we won't be using any ink, just PAPER, for this program.

Line 120 PRINTs 16 blank spaces across the screen (see the comma?), then changes the Brightness level
to " 1 ", or "on", then PRINTS another 16 spaces for the rest of the screen line, then goes back to BRIGHT 0 ("off"). Line 130 does exactly the same thing, but on the next screen line. Don't forget the commas after both PRINT statements in each line, or you'll get line feeds you don't want. Line 40 , of course, simply goes back to increase the value of $p$ in Line 110 if it has not yet reached 7. The result is you get two screen lines in each of the seven colors.

Notice that the left side of the screen shows the regular colors, in the sequence shown above the number keys, and the right side shows the same colors, but BRICHTer. On a properly adjusted black and white television, you'll be able to distinguish not only the colors but the brightness levels except for the black. On a color television or NTSC monitor, this "palette" will allow you to adjust for the proper colors (the yellow, for example, should not be orange), but the brightness differences might be hard to detect in the low-number colors.

## paper And ink

Listing 2 changes the colors of the PAPER, the inK and even the border. Line 110 sets the PAPER color in a loop, and line 120 sets the INK and border color in another "nested" loop. In other words, the
ink/border loop performs the line 130 PRINT statement eight times (for $i$ values of 0 to 7 , with $p$ equal to 0 ), and then the NEXT p in line 140 does it all over again, but with p equal to 1. This continues until p finally exceeds 7 , when the program "falls through the loop" to line 150 , where the PAPER and INK colors are reset.

## Which ink On Which Paper?

Run this program (pressing Y or ENTER when "scroll?" appears at the bottom of the screen) and you'll see the many PAPER and InK combinations available ( 64 in this program) - and how many of them are almost unreadable! Obviously, in every case where PAPER and INK are the same color, you can't see the PRINTing, even though it's there. Figure 2 shows the suggested color combinations for best readability. Actually, if you don't need color for your application, it's very hard to beat black ink on white PAPER for legibility.

To flash Or Not To flash?
Another "attribute" that effects a character space is FLASH. Just to add excitement to this program, add line 125:

## 125 FLASH 1

Also, add FLASH 0 at the end of line 150 to reset the FLASH to "off" at the end of the program, so you can look at a listing without going batty. Now, run the program and

Figure 2. Best PAPER and INK combinations for maximum legibility. PAPER COLOR \& NUMBER INK COLOR NUMBER

|  | Black | 0 |
| :---: | :---: | :--- |
| $3,4,5,6,7$ |  |  |
|  | Blue | 1 |
| $4,5,6,7$ |  |  |
|  | Red | 2 |
| 6,7 |  |  |
|  | Magenta | 3 |
| $0,6,7$ |  |  |
|  | Green | 4 |
| 0,1 |  |  |
|  | Cyan | 5 |
|  | Yellow | 6 |
|  | White | 7 |

## Freature

Figure 3. How the printer sees the mosaic (ink only).

you'll see each color flashing but so much is going on, it's hard to tell exactly what's happening. If you watch closely, you'll see that each section of the screen changes its PAPER color to its Ink color when it's Flashing. However, this would make the PRINTing disappear, so the Ink color changes to a contrasting color (black or white only) during the FLASH period. Then back to normal - all in about a half a second.
Use Y or ENTER to continue to the end of the program when "scroll?" appears at the bottom of the screen, and then press the L key for List. The program listing will appear, pushing up the colors - which keep on FLASHing! So, even if you move a FLASHing character, it keeps on FLASHing until you use FLASH 0 either from the keyboard or in the program. Another way of saying this is that the attributes (PAPER. INK, BRIGHT and FLASH) apply to the character when it was originated or last changed, not the screen location.

## Attributes " 8 " And " 9 "

The number " 8 " may be used with PAPER, INK, FLASH and BRIGHT, but not with BORDER. The " 8 " is used as a precaution to keep from changing the existing attribute. PAPER 8, inK 8, FLASH 8 or BRIGHT 8 simply leave these attributes in the character attribute file as they were - no change. This is called a
"transparent" instruction, since it allows the original attribute to continue. If you're putting something on the screen and you don't want to change its PAPER, INK, FLASH or BRIGHT mode, dhen use " 8 " (without the quotes, such as ink 8.)
The " 9 " is much more useful, but can only be used with PAPER and ink. If ink 9 is used, it assures you that any PRINT instruction will be in either black or white ink, to make it most visible against the PAPER color. For PAPER colors black, blue, red and magenta $(0-3)$ white 1 NK is used. For Paper colors green, cyan, yellow or white (4-7) black Ink is used. Similarly, PAPER 9 will provide white Paper for ink 0-3 and black PAPER for INK 4-7.

## Try It Yourself

So you don't believe the T/S2068 is really that smart? Well, here's a "four-liner" (that could be a "oneliner") to prove it. Use NEW to clear memory, then type Enter, and run this short program:

```
10 FOR x = 0 TO 7
20 PAPER x: INK }
30 PRINT "Testing....."
40 NEXT x
```

Now, do you apologize? Pretty smart machine, eh? Actually, this mode is invoked in any character space where FLASH is "on", to assure PRINT legibility. This means in the regular mode, the PAPER and ink in a Flashing space are as programmed, but when the FLASH occurs, the PAPER color becomes the ink color, and the ink color becomes either black or white, depending on the (now) PAPER color.

## The Mandatory Mosaic

One cannot cover the subject of color with computers without presenting a randomly-generated mosaic pattern. You'll find mine, simple as it is, in Listing 3. Line 20 uses the randomize statement (shown as RAND on the T key), and all that does, without exposing you to the horror of the theory of pseudo-random number gener-

> Listing 1.
> Color palette.

> Listing 2.
> PAPER and INK.

## Listing 3.

Color mosaic.
ators, is to assure that you will never get the same pattern twice.

Line 30 picks random (RND) values (actually, pseudo-random values, but we decided to avoid that distinction) for variables $x$ and $y$. The value of $x$ can fall anywhere from 0 to 21 , and y can be up to 31 . Line 40 sets variable $z$ equal to a number from zero to 15 , plus 128 , or a range of 128 to 143 . You'll see why in a moment.

Let's skip line 45 for now. We'll come back to it. Line 50 sets variable $p$ and $i$ each to a number from 0 to 7. Line 60 does the real work, by printing a graphic character with PAPER color $p$, using INK color $i$ at a screen location $x$ rows down and y character spaces to the right of the upper left hand corner. Huh? Read it again if you're still confused.

But what "graphic character"? That's what CHR\$ is for, with
variable z telling it which particular character. Variable $z$ can be any number (line 40) from 128 to 143. If you'll look in your Timex 2068 Manual, you'll find that the 2068 character set assigns these numbers to the low-resolution graphics characters. So, CHR\$ simply prints that character at the PRINT AT position specified by $x$ and $y$. Line 70 then routes the program to line 30 to do the whole thing again. After about 10 minutes the screen is completely full of a graphic quiltwork in all the colors. It looks like an infrared photo of the San Fernando Valley in California on a summer day, with red (hot) houses and blue (cool) pools . . .

Oh, you still want to know about line 45 , huh? Well, it just so happens that PAPER. INK, PRINT AT and CHR\$ are all smart enough to round-off random numbers up or down to the nearest integer. In
other words, 13.4 becomes 13, but 13.5 becomes 14. This is no problem with PAPER, INK or PRINT AT in this program (but it could be in others, so be aware of this odd characteristic) but it could produce a $z$ value of 128 . This is a blank space character that pokes holes in the mosaic, so line 45 eliminates this chance.

Figure 3 shows how the Timex Sinclair 2040 Personal Printer "sees" a partially complete mosaic. It's "color blind" and only prints INK dots, regardless of color (even if they are the same color as PAPER dots, and therefore "invisible" on the screen!).

## What If You're Color Blind?

If you are part of the population that is color-blind, it doesn't matter anyhow . . . In fact, this whole article could have been skipped! ("Now he tells me . . .')


For more informotion, circle 25 on reader service card.

## Feature

## The Music Maker

## Neal Bridges shows how you and your T/S,ZX can make beautiful music together

MUSIC MAKER is a new editing program that allows you to play music on the 16 K T/S1000,ZX81. Up to seven songs can be stored within the program, each up to 200 notes in length. Only one voice is available, however, and this limits the program to playing simple melodies. You control the duration of each note and the tempo of each song.

## Entering The Program

The program must be entered in two sections. First, type in Listing 1 for the first program, and run this program. Then delete all program lines except line 0 , which contains a machine language routine that makes music; it can't be deleted, anyway. Here is the assembly language listing:

|  | LD H,0A | ;tempo |
| :--- | :--- | :--- |
| LOOP1 | LD L,56 | iduration |
| LOOP2 | LD BC,1301 | ;tone code |
|  | PUSH BC |  |
|  | OUT(FF),A |  |
|  | CALL PAUSE |  |
|  | POP BC |  |
|  | IN A,(FE) |  |
|  | CALL PAUSE |  |
|  | DEC L |  |
|  | JR NZ LOOP2 |  |
|  | DEC H |  |
|  | JR NZ LOOP1 |  |
|  | RET |  |
| PAUSE | INC B |  |
|  | DEC B |  |
|  | JR Z CHKC |  |
| WHIT | DJNZ WAIT |  |
|  | INC C |  |
|  | DEC C |  |
|  | RET Z |  |
|  | DEC C |  |
|  | IR WAIT |  |



The sound can be heard in three ways. The first is the best:
(1) Connect a high gain amplifier to the MIC lead coming from the computer. A cassette recorder that allows you to monitor what is being recorded is suitable.
(2) Increase the volume of your television. Some retuning may be necessary for the best sound quality.
(3) Place an AM radio near the television while the music is being produced. The radio should be tuned to a very weak station. The music can then be heard through the radio.

To test the machine language in line 0 , use one of the above methods to hear the steady buzz of the television, then type RAND USR 16514.

This should produce a pitch of A above middle C , or 440 Hz , lasting for about two seconds. While the sound is being produced, a number of thick black bars will be visible on the screen, similar to the patterns produced during loads and Saves. After the tone has been produced, your normal television picture will reappear.
If you achieved the above results, you may proceed to type in the second program, Listing 2 . This is the music editing program. Once it is entered, type RUN, and read the operating instructions.

## Operating Instructions

When the program is RUN or LOADed from tape, the menu will be displayed. There are 15 options to


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9991 SOR L＝ 1 TO 28
g日ge PRINT＂NTEITH』 SMRLL HONDER
5993 NEXT
9993 NEXT L
9994 PAUSE 100
9995 CL 5
9996 RETURN
NOTE：Add Copy Space Doee Not Allow Ue Foom To Print A Lengther Preaentable Program
TIMEX SINCLAR IS A TRADE MAPKK OF THE TMEX COMPUTER COAP
choose from; what follows is a description of each.
NEW SONG (press B). This will erase the current song. If the song has been stored the stored copy will not be affected. The title of the current song is reset to "NOT LISTED", and the present tempo is reset to 10.
WRITE (press F). The length of the current song is displayed, along with the last note entered when in the Write mode. If no notes have been entered, the last note entered will be displayed as " $\qquad$ ". If the song has been STOREd, or is greater than 199 notes in length, "? SONG FULLERROR" will be displayed at the bottom of the screen. This is an error message.
Note: If at any time an error message is received, pressing any

## Duration Codes.



Tone Codes.

| (High) |  |  |  | Octave | (Low) |  |  |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| Tone | : | 1 | 2 | 3 | 4 | 5 |  |
| C | : | 072 | 0E8 | 1D2 | 3 A 7 | 769 | Lous |
| CH:DF | : | 06B | 0DB | 188 | 372 | 6FA |  |
| D |  | 065 | OCF | 19F | 341 | 691 |  |
| DH:EF | : | 05F | 0 C 3 | 188 | 311 | 623 |  |
| E | : | 059 | 0B7 | 171 | 2 E 6 | 5DA |  |
| F | : | 054 | OAD | 15C | 2BC | 582 |  |
| F\#:DF | : | 04F | 0A3 | 148 | 295 | 532 |  |
| G | : | 04A | 09A | 135 | 26E | 4E4 |  |
| G\#:AF | : | 046 | 091 | 124 | 24B | 49B |  |
| A |  | 042 | 088 | 113 | 22A | 45A |  |
| $\mathrm{A} \#: \mathrm{BF}$ | T |  |  | 103 | 20B | 417 |  |
| B O | P | $03 A$ | 079 | OF7 | 1EE | 3E1 |  |
|  | , |  | 072 | OE8 | 1D2 | 3 A 7 |  |
| Rest : Off 14 |  |  |  |  |  |  |  |

program to continue. If the song is not full, you will see an input prompt. Each tone and duration that the program can produce has its own code. See the chart accompanying this article for a list of tone and duration codes. Notes are entered using these codes.
For instance, this familiar tune:


No spaces are entered. A note is entered as a three-digit tone code. The duration code can be a value from one to 99. A string of notes can be entered in one go. However, if any of the notes in the string take up more or less than five characters, "? INCORRECT ENTRY ERROR" will be displayed, and all the notes entered in that string will be lost.
To return to the menu, simply press ENTER instead of entering a note.
EDIT (press E). This option
allows you to change the tone and duration of a single note. Enter the number of the note that you wish to change. For example, if you wished to change the Eb in the above example, you would enter 4 to indicate the fourth note in the song. END may also be entered if the song has not been stored. END refers to the last note in the song. Expressions such as END - $5^{\prime \prime}$ are also accepted. If the value entered is less than 1 or greater than the length of the song, "? NOTE OUT OF RANGE ERROR" will be displayed. If the entry is within range of the current song, the tone and duration codes for that note will be displayed on the screen. You may enter the new values for this note, using the same format as in the "WRITE" mode. If you do not wish to enter the new values, pressing ENTER will return you to the menu.
DELETE (press H). This option enables you to delete a single note or a group of notes from the current song. The notes specified in the "FROM NOTE" and "TO NOTE" entries will also be deleted. Expressions using "END" are also accepted.
For example, if you wish to delete note four from the current song, enter the value of 4 for both the "FROM NOTE and "TO NOTE" entries. If the notes you enter are out of range, "? NOTE OUT OF RANGE ERROR" will appear.
INSERT (press 1). This option allows you to insert a note in the current song. Enter the note before which you wish to insert a new value. Expressions using END are accepted. If the value you enter is out of range, "? NOTE OUT OF RANGE ERROR" will be displayed. Otherwise, you will be able to insert a new note before the specified note.
PLAY (press A). This option will play the current song. The title of the current song will be displayed on the screen. If the song is empty, "? INCORRECT SONG LENGTH ERROR" will be displayed. If the song does exist, however, the preset tempo of the song will be listed next to an input block. If you

## Featres

type in a value from 1 to 99 , the song will be played at this tempo; 1 is very fast, and 99 is very slow. If enter is pressed instead of entering a value, the song will be played at the present tempo displayed next to the input block. If the title of the song is "NOT LISTED", the preset tempo will be 10. Values around 10 are suitable for most songs.


LIST (press N). This option enables you to list one or more notes in the current song. Enter from which note and to which note you wish to be listed, and whether or not a printout is required. If either of the note entries is out of range, "? NOTE OUT OF RANGE ERROR" will be displayed.
After the screen has been filled, pressing any key except break will allow you to continue with the listing. At this point, if the printer option was chosen, the screen will be copied onto the printer. After the listing is complete, you will be returned to the menu.
DUPLICATE (press G). This option allows you to duplicate a previously entered section of the current song, to avoid retyping frequently-used phrases of notes. Enter from which note and to which note you wish to be duplicated. These notes will be added to the end of the current song.

STORE (press M). This option allows you to store the current song in the computer's memory; a maximum of seven songs can be stored within the program. If seven songs have already been stored, "? OUT OF RAM SPACE ERROR" will be displayed when this option is chosen. Otherwise you may enter the name of the current song (up to 25 characters in


length), and the tempo at which it sounds best. It will then be stored in the memory.
CHOOSE (press C). This option will list the songs that have been stored so far, and allow you to choose one of them to become the current song. If no songs have been stored, pressing C will have no effect. The titles are listed on the screen and you may enter the number of your choice. If your choice is less than 1 or greater than the number of songs listed, "? UNLISTED SONG ERROR" will be displayed.

REPLACE (press D). If you have EDITed a previously stored song, you can replace the stored song using this option. Enter the title of the song that you wish replaced by the current song. If no such title exists, "File not found" will be displayed; if it does exist, 'FOUND (name of song)" "REPLACED" will be displayed. The stored song will have been replaced by the edited song. You may enter a new title. If "SAME" is entered, the title will not be changed. A new tempo may then be entered, or, if only ENTER is pressed, the tempo will not be changed, and you will be returned to the menu.

FAST (press K). This will switch the program into the FAST mode.

SLOW (press L). This switches the program into the slow mode. When in the slow mode, the program will switch into the FAST mode when necessary.

SAVE (press J). This option will save the program, along with all stored songs, on cassette tape. Type the name that you wish to call the program. Start the recorder recording, and press enter. After saving, you will be returned to the menu.

EXIT (press 0). This will break out of the program with the error code of $0 / 1255$.
If the program should ever stop for any reason, do not type run to restart it, as this will erase all the stored songs. Type goto menu instead.


## Keyboard Overlay

If you like everything about your T/S,ZX except its original membrane keyboard, and can't afford a new keyboard, why not try a plastic keyboard overlay? The "Contact Lens," a custom-designed overlay made of clear non-glare plastic with rectangular wedge-shaped holes, lets you type faster, stops missed keys, improves accuracy and accommodates even large fingers. Its adhesive backing makes it a cinch to install over the original membrane keyboard. Available for $\$ 7.95$ from Warren Imports Group, 81 Brookmill Blvd., Unit 80, Agincourt, Ontario Canada M1W 2 L5.


## Upcoming Events

Nov. 14-17: Canadian Camputer Shaw, Taronto, Ont., Canada
Nov. 15-17: Buffalo Camputer \& Industrial Tech. Show, Buffalo, NY
Nov. 15-18: Compec, London, England
Nov. 17-20: Computer Shawcase Expo, Chicago, IL
Nov. 28-Dec. 2: Comdex/Fall '83, LasVegas, NV

Tax Return Help
KSOFT announces that its Tax Return Helper, cansisting of five programs ta help in filling aut Farm 1040 and Schedules A, B, C, D and E, will be available in January. Data is directly entered on a screen copy of the form. The programs perfarm all camputations and even detect some of yaur errars. As in an electranic spreadsheet, when you make a change all the lines affected by it are updated an the spat and Form 1040 and Schedule A are autamatically correlated. Cast: $\$ 14$ for the 16 K T/S1000,ZX81; $\$ 18$ for the T/S2068: bath are tax deductible. (Add $\$ 1.50$ s\&h). KSOFT affers a $\$ 5$ discount far buyers of previaus editians. KSOFT, 845 Wellner Rd., Naperville, Il 60540.

Dec. 6-8: Business Expo, Dallas, TX
Dec. 8-9: ACM Canference an Persanal \& Small Computers, San Diego, CA
Dec. 8-11: 3rd SouthEast Computer Show, Atlanta, GA

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[^2]:    Note: This orticle is on excerpt from the outhor's new book, "Timex 2000 Beginner/Intermediate Guide" (Howord W. Sams \& Co. Book 22225)

